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INTELLIGENCE OF TROOPS INFECTED WITH HOOKWORM VS. THOSE NOT INFECTED

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HISTORY AND PROCEDURE

During the War, Major B. F. Pittenger, Sanitary Corps, chief psychological examiner at Camp Sevier, in collaboration with Major Charles A. Kofoid, Sanitary Corps, in charge of the Laboratory Car Metchnikoff, made a study of the comparative intelligence ratings of the recruits found to have hookworm infection and those without infection, of the 9,254 men of the April, 1918, draft increment. A report thereon to the Office of the Surgeon General, Division of Psychology, was made by Major Pittenger in comparative tables for hookworm and non-hookworm groups, respectively, in terms of Alpha and Beta scores, for white and for colored troops. Of these data Major Charles A. Kofoid and Lieutenant J. P. Tucker, Medical Corps, offer some interpretation in their report to the Laboratory Division of the Surgeon General's Office "on the relationship of infection by hookworm to the incidence of morbidity in 22,842 men in the United States Army at Camp Bowie, Texas, from October, 1917, to April, 1918."

The manifest inferiority of the median intelligence scores of the 762 hookworm cases to the 8,492 non-hookworm cases suggested the desirability of a more comprehensive study wherein each hookworm case could be paired with a non-hookworm case from the same local community. Accordingly Major Kofoid recommended to the Surgeon General a co-

operative study of the problem by the Laboratory Division and the Section of Psychology. A psychological officer was not immediately available, but Major John L. Riley, Sanitary Corps, was released by the Section of Physical Reconstruction for temporary duty with Major Kofoid in organizing and promoting the early work of this investigation. Under their direction a group of officers, laboratory technicians and enlisted men proceeded to assemble and to code for Hollerith treatment the intelligence ratings of recruits infected with hookworm and of their non-infected pairs.

During the second week in July, 1919, Captain Garry C. Myers of the psychological personnel became available for duty on this investigation. He reported to the Surgeon General to select and ship records from the files of the Section of Psychology to the Port of Embarkation, where initial work was already in progress. A week later he was ordered to U. S. A. Laboratory, Port of Embarkation, New York City, for duty in connection with the statistical treatment of the records.

The personnel at the laboratory, in charge of Lieut. Col. Edwin H. Schorer, varied from seventeen officers, enlisted men and women during July and early August to five officers and assistants in early September. Different officers from time to time awaiting their discharge were assigned for but a few days, whereas Second Lieutenant Conrad Erwin Ronnenberg, Sanitary Corps, and Lieutenant Henry S. Weigle, Medical Corps, were indispensable collaborators throughout the whole period of the work at the port of embarkation.

Major Kofoid left the service on August 8th and Major Riley left the service on September 6th, leaving the work in charge of Captain Myers, who again reported at the office of the Surgeon General on September 10th to complete the study. Upon his arrival, it was found that inordinate demands upon the statistical department eliminated all hope of final Hollerith tabulation of the data and it appeared that completion of the study would have to be postponed indefinitely. However, through the interest and initiative of Colonel Joseph F. Siler, Medical Corps, of the Laboratory Division and Colonel F. F. Russell, Medical Corps, of the Army Medical School, two enlisted men were assigned to assist Captain Myers in assembling the data by the traditional method of hand tallying. Frequency tables were thus completed in about three weeks. Sergeant Benjamin M. Oppenheim was then loaned by the Division of Coordination, Organization and Equipment to plot the graphs.

Thus it will be perceived that Major Kofoid initiated the

study and the larger machinery for its execution; Major Riley supervised the greater portion of the work assembling the data for this study at the port embarkation; and Captain Myers is responsible for the final assembling and treatment of data with their interpretations.

The methods of pulling intelligence rating cards was as follows: Each time a card of a hookworm soldier was found, another card was paired with it, of a soldier, reported on hookworm rosters as not having hookworm, and whose home address was of the same county as that of the hookworm case with whose card it was paired.

The study was started with the hope to compare 10,000 hookworm cases paired with 10,000 non-hookworm cases from the same local areas in terms of home addresses. However, owing to the frequent disparity between the groups and organizations surveyed for hookworm and the groups and organizations surveyed by the intelligence rating boards (since the latter boards were organized in some camps subsequent to the earlier hookworm surveys) and to the absence of necessary data either from the hookworm rosters or from the intelligence rating cards, only 6,639 hookworm and 6,639 non-hookworm cases were studied, of which number of each there were 612 cases of colored troops.

In every instance where two or more examinations had been given, that score was counted which on the basis of the equivalent mental age scale as per the Psychological Examiner's Guide, page 91, gave the highest record. All Alpha and all Beta records were assembled in separate tables and all individual-tests records were merged with Alpha and Beta scores into a common scale on the basis of equivalent mental ages, which in turn were converted into equivalent letter ratings as per Examiner's Guide, page 91.

The statisticians[1] in the Section of Psychology of the Surgeon General's Office who had developed these mental age and letter rating equivalents to meet an urgent need during the war, had found in a later study that these equivalents were but roughly accurate. Consequently they, with the help of Karl Pearson, developed by an elaborate and exhaustive study the groundwork of very refined equivalents. However, these statisticians left the service before a table was developed applicable for this study. Certainly then the ratings of this study, which are indicated by the "Common Scale," are not so exact as they ought to be; yet they are the best which the available standards offered as expedient.

[1] Mr. Carl R. Brown and Lt. Mark A. May.

In addition to the intelligence rating the chronological age and years of schooling were taken into account. Rank also was noted early in the study but because the intelligence record cards—as would be expected since they were taken soon after the recruits entered camp—listed practically all soldiers as privates, rank difference proved sterile for this study.

Furthermore, the record cards were pulled on the basis of "heavy territory" and "light territory," the former meaning a county in which the army hookworm survey indicated more than 10% of recruits infected with hookworm; the latter, less than 10% of recruits infected. In case, then, an intelligence record card was found of a soldier infected with hookworm, whose home address was in a light county, the intelligence record card of a non-hookworm soldier from the same county was pulled.

With the negroes, whose intelligence rating cards as well as hookworm survey rosters were sometimes designated as merely from Texas, say, or Tennessee, it was almost impossible to compare light territory and heavy territory groups. This fact, in addition to the relatively small number of cases, explains why the colored troops are limited to one general table of comparison of hookworm cases with non-hookworm cases.

RESULTS

TABLE I

PER CENT DISTRIBUTION OF RATINGS

All White Troops

	Alpha		Beta		Com. Scale	
	Hook-worm	Non-hook-worm	Hook-worm	Non-hook-worm	Hook-worm	Non-hook-worm
A	1.2	3.0	0.7	1.1	1.5	3.5
B	4.4	7.9	1.1	2.2	4.6	8.2
C+	11.5	16.6	2.2	4.2	7.3	10.9
C	26.9	29.6	10.6	14.1	23.7	27.4
C—	30.3	25.2	27.6	25.6	34.8	29.6
D	17.4	11.7	40.1	36.9	19.3	14.5
D—	8.1	5.8	17.4	15.7	8.5	5.9
			White Troops (Heavy Territory)			
A	1.1	2.6	0.6	0.9	1.3	2.9
B	4.8	7.4	0.9	2.1	4.6	7.3
C+	12.3	17.1	2.2	3.8	7.0	10.3
C	27.0	30.7	10.0	14.0	22.5	26.7
C—	30.7	24.8	27.9	26.0	34.8	29.7
D	16.8	11.3	41.9	38.2	21.0	16.5
D—	7.3	6.1	16.5	15.0	8.8	6.6
			White Troops (Light Territory)			
A	1.4	3.6	1.2	2.3	1.8	4.7
B	4.0	8.7	1.9	2.5	4.6	9.8
C+	10.4	16.0	2.3	6.0	8.1	12.1
C	26.8	28.1	12.9	15.0	26.2	28.7
C—	29.8	25.8	26.7	24.0	35.0	29.5
D	18.2	12.3	34.2	31.0	16.2	10.8
D—	9.4	5.5	20.8	19.2	8.0	4.4
			Colored Troops			
A	0.0	0.0	0.7	1.3	0.7	1.6
B	1.8	1.5	0.7	2.9	1.1	2.0
C+	1.8	3.5	1.4	3.6	1.0	2.8
C	6.2	10.4	5.2	5.2	5.0	7.2
C—	17.3	14.8	11.0	11.4	15.2	18.8
D	16.7	22.3	37.2	33.3	38.4	35.9
D—	56.2	47.5	43.8	42.2	38.6	31.7

TABLE II

MEDIANS OF HOOKWORM CASES VS. MEDIANS OF NON-HOOKWORM CASES

White Troops

	Alpha		Beta		Com. Scale (Mental Age)		Age (Chronol)		Schooling	
	Number	Median	Number	Median	Number	Median	Number	Median	Number	Median
Total Cases Hookworm	3546	40.5	2251	40.6	6027	12.26	5930	24.2	4456	6.1
Total Cases Non-Hookworm	3940	51.4	1950	43.2	6027	13.00	5796	25.0	4597	6.7
Hookworm Inferiority		10.9		2.6		.74		.8		.6
Per Cent Inferiority		21.2		6.0		5.70		3.2		8.9
Hookworm Heavy Territory.	2083	41.8	1731	40.6	3972	12.34	3911	24.3	3154	6.0
Non-Hookworm Heavy Territory	2310	51.8	1596	42.8	3972	12.83	3860	25.1	3260	6.4
Hookworm Inferiority		10.0		2.2		.49		.8		.4
Per Cent Inferiority		19.3		5.1		3.8		3.2		6.2
Hookworm Light Territory...	1463	39.3	520	40.5	2055	12.46	2019	23.9	1302	6.5
Non-Hookworm Light Territory	1630	50.8	354	44.8	2055	13.32	1936	24.8	1337	7.7
Hookworm Inferiority		11.5		4.3		.86		.9		1.2
Per Cent Inferiority		22.6		9.6		6.4		3.6		15.6

Colored Troops

Hookworm	162	12.6	290	23.8	612	10.04	600	23.7	340	3.5
Non-Hookworm	202	16.1	306	24.0	612	10.50	602	24.4	313	4.1
Hookworm Inferiority		3.5		.2		.46		.7		.6
Per Cent Inferiority		21.7		.8		4.4		2.9		14.6

TABLE III

AVERAGE NUMERICAL SCORE OF SUCCESSIVE TEN PER CENT STEPS FROM HIGHEST TO LOWEST.

All White Troops

	Alpha		Beta		Com. Scale	
	Hookworm	Non-Hookworm	Hookworm	Non-Hookworm	Hookworm	Non-Hookworm
1st (highest) ten per cent	111.7	128.9	80.4	87.2	16.7	17.5
2nd " " "	78.5	95.2	65.2	69.9	14.5	15.8
3rd " " "	63.3	78.2	54.6	61.5	13.6	14.6
4th " " "	52.7	65.4	49.1	53.3	12.9	13.7
5th " " "	44.1	55.4	43.1	45.7	12.3	13.1
6th " " "	36.5	46.4	35.9	39.3	11.7	12.4
7th " " "	30.3	38.8	29.0	33.4	11.2	11.8
8th " " "	24.2	30.2	23.8	25.2	10.6	11.1
9th " " "	18.8	22.6	17.8	19.1	9.8	10.2
10th " " "	10.5	12.2	8.0	8.1	8.6	8.9
Colored Troops						
1st (highest) ten per cent	71.1	80.2	74.6	86.3	14.6	16.1
2nd " " "	35.9	44.6	49.4	61.5	11.5	12.5
3rd " " "	25.7	29.8	35.4	45.2	10.6	11.3
4th " " "	19.2	21.8	31.1	34.4	10.0	10.6
5th " " "	14.0	17.3	26.0	27.2	9.9	10.1
6th " " "	11.5	13.1	20.1	21.0	9.5	9.7
7th " " "	6.9	9.9	14.4	16.2	9.0	9.4
8th " " "	6.4	6.7	10.6	12.2	8.7	8.9
9th " " "	2.0	2.0	7.0	6.9	8.3	8.5
10th " " "	2.0	2.0	2.2	3.5	7.4	7.7

Table I shows the comparative distribution by letter ratings of hookworm and non-hookworm groups for Alpha, Beta and "Common Scale," for all white troops, for white troops of light territory and of those of heavy territory, and for all colored troops. Median numerical scores for Alpha and for Beta, median mental age (Common Scale), median chronological age and median number of years attending school are given under corresponding legends in Table II. These distributions of ratings of ages and years of schooling with their respective medians are all presented graphically in plates 1-22.

Furthermore, all the hookworm troops are compared with all the non-hookworm troops in respect to successive 10% increments in Alpha, Beta and "Common Scale," as shown in plates 17-22.

Data from which these graphs are constructed are given in Table III.

Analysis and Interpretation

By reference to Tables I and II it is found that the intelligence of hookworm troops is lower than for the non-hookworm troops; that they have fewer years of schooling; and that they are younger chronologically. Mere inspection of the tables show these differences to be unmistakable and to be based on such a large number of cases as not to warrant computation of a mathematical probable error of these differences.[2] Furthermore, all these differences are greater for white troops from "light" territory than for those from "heavy" territory and, in most cases, greater for the white troops than for the colored troops.

Moreover, when, according to Table III and graphs, plates 17-22, hookworm and non-hookworm troops are compared by average score of successive 10% steps from the highest to the lowest, it is clear that the difference in intelligence rating between hookworm and non-hookworm troops of the lowest level of intelligence is comparatively slight. From this it is safe to infer that the lower the intellectual scale, the less the relative inferiority of the hookworm troops.

So much for the data. What do they mean? Before offering an interpretation, let there be a critical survey of earlier

[2] It should be noted that the sum of the Alpha cases and of the Beta cases of hookworm and non-hookworm groups, respectively, do not quite equal the total number for each group in the "Common Scale" column, since the difference was made up by the individually examined cases. Likewise the total numbers for the age and schooling columns do not, as they should, equal the totals of the Common Scale column, since some troops failed to note their age, some their schooling, and some, both.

studies of similar problems. The first study designed to measure the influence of hookworm disease on intelligence was made on school children by E. K. Strong under the auspices of the Rockefeller Foundation, in 1916.[3]

From his study, Strong concludes:

1. "Hookworm disease interferes very radically with mental development."

2. "Treatment alleviates this condition to some extent, but it does not, immediately at least, permit the child to gain as he would if he had not had the disease."

3. "The longer the child has the hookworm disease, the less will be the improvement mentally when the child is treated."

4. The last statement Strong considers as "probably the most important deduction from this whole study."

Such are Strong's conclusions, which corroborate the average man's casual observation of the apparent effect of hookworm disease and, in support of which, all who are interested in stamping out the disease are eagerly waiting for conclusive scientific data. *But neither Strong nor anyone else has yet produced such data.*

Strong compared the gains made in several of the then most highly standardized single group intelligence tests after a period of three and a half months by the following group of school children:

18 children without hookworm.
9 untreated hookworm children.
27 completely cured hookworm children.
17 incompletely cured hookworm children.

All these children were given the Binet-Simon Test, in addition to seven other mental tests, calculation test, logical memory, opposite test, memory span, handwriting, form-board test, all of which, together with the Binet test were repeated after an interval of three and a half months. The difference between chronological age and Binet age for the respective groups was found to be: non-hookworm children, —1.0 year; completely cured hookworm children, —1.6 years; incompletely cured hookworm children, —2.2 years; and untreated hookworm children, —1.2 years. According to the chronological age distribution for the various groups, all the non-treated hookworm children fall between the ages 9.9-10.9 years, while all the other groups are rather evenly divided between the age intervals 9.9-10.9 years and 11-12 years.

[3] Effect of Hookworm Disease on the Mental and Physical Development of Children. N. Y. The Rockefeller Foundation, 1916.

Now it has been pointed out that for ages above 10.5 or 10 years, mental age cannot be accurately determined by the old Binet test, which fact Strong himself records in a footnote of his study (page 74). Of this shortcoming of the old unrevised Binet test which was used by Strong, Terman has to say the following: "The proportion of feeble-mindedness among adult subjects was greatly overestimated, because subjects who were really of the 12 or 13 years mental level could only earn a mental age of about 11 years."[4] He finds furthermore that young subjects get too high a mental age: "In young subjects the higher grades of mental deficiency were overlooked, because the scale caused such subjects to test only a little below normal."

There is a very high probability then that Strong's mental ages are not the true mental ages and that the non-treated hookworm group, a comparatively young group, had a mental age deficiency of considerably over 1.2 years; and that since all the other groups fall pretty heavily into the 11 to 12 age group, their mental age deficiency found by Strong is too great. Indeed, on the basis of the age distribution of the groups it is highly probable that for increasing order of mental age deficiency the groups stand: non-hookworm children, completely cured hookworm children, incompletely cured hookworm children and untreated hookworm children.

Strong's data on the social status of the groups help corroborate this probability, for of the non-hookworm children 94% came from the best grade of homes, 0% from the poorest. Of the completely cured hookworm children 41% came from the best grade of homes, 15% from the poorest. Of the incompletely cured hookworm children 12% came from the best grade of homes, 29% from the poorest. Of the untreated hookworm children 33% came from the best grade of homes, 56% from the poorest. This is considered a corroboration of the assumption that better social environment on the whole presupposes a higher level of intelligence in that environment. Considerable data[5] are available in support of the latter assumption.

It so happened that on the whole the gains in the second trial of the several mental tests (other than Binet) classified the groups in the order, non-hookworm children, completely cured hookworm children, incompletely cured hookworm children and untreated hookworm children, which is the same

[4] The Measurement of Intelligence, Lewis M. Terman, p. 3.

[5] Lewis M. Terman, The Measurement of Intelligence, pp. 72-73. Robert M. Yerkes, James W. Bridges, Robert S. Hardwick, A Point Scale for Measuring Mental Ability.

order as the very highly probable mental age order of the groups to start with, as was shown above. *If the latter be true, then the order of gain is but to have been expected, hookworm or no hookworm.* It is now generally accepted as a fact that the more intelligent learner learns the more rapidly. Strong[6] himself has furnished data elsewhere which he apparently had forgot when interpreting his data on hookworm. He concludes from an experiment on school children:

"The slope of learning curves of school children based on simple arithmetical combinations apparently correlates to a very considerable extent with the general intelligence of the children." A few years previously Colvin, practicing five normal subjects with five subnormal at canceling A's, found that "in every case the normal child made greater improvement with less fluctuation than did the subnormal child."[7]

Likewise the writer found from a card sorting practice on 27 normal school students for 50 minutes a day, with the practice repeated after 10 days, 11 days and 3½ months, respectively, a positive correlation of +.48 between maximum gain and intelligence, when there was no correlation between initial performances and intelligence. This indicated pretty clearly that the +.48 correlation showed a very real positive relationship between intelligence and learning ability. It should be noted that "intelligence" was determined by having each student rank all the other students of the class on the basis of her estimate of each student's intelligence, from which a combined ranking was computed.[8]

Assuming, then, that the four groups studied by Strong had at the beginning of the study mental capacity in the order,—non-hookworm children, completely cured hookworm children; incompletely cured hookworm children, and untreated hookworm children; which his difference between chronological and mental ages (p. 21) indicates when these data are interpreted in the light of Terman's Revision of the Binet tests, that the gain, therefore, for these groups after 3½ months

[6] Learning Curve as a Diagnostic Measure of Intelligence,—Psychological Bulletin, 1917, Vol. 14 pp. 153-154.

[7] S. S. Colvin, Notes on Certain Aspects of Learning—Psychological Bulletin, Feb. 15, 1915, Vol 12.

[8] Garry C. Myers, Some Variabilities and Correlation in Learning. Amer. Jr. Psychol. July, 1918, Vol. 29 pp. 316-326.

Since completing this study the writer has demonstrated in a practical way that learning progress is in proportion to intelligence ratings, in a school of 1,800 illiterates whom he classified on the basis of intelligence ratings. See Principles, Plans and Purposes of the Recruit Educational Center, Camp Upton, N. Y., War Department, Washington, D. C.

should show exactly that order is just what should be expected, regardless of hookworm. *Apparently, then all Strong's study has shown is that brighter children learn faster than duller children.*

It must be said of Strong's work that his method of attempting to measure the effect of hookworm on mental development in terms of relative learning gains by hookworm and non-hookworm children is highly commendable. His method, if refined by comparing groups of equal mental and social status on the basis of their learning rate as measured by learning curves developed with considerable practice on specific learning tasks and on large number of children, should help measure with a good deal of exactitude the influence of hookworm disease on intelligence.

Strong also studied 11 children—not included in the part reviewed above; who on the average were 13.5 years of age, comparing this group with the 17 incompletely cured hookworm children averaging 11.1 years chronologically, both groups coming " from homes of approximately the same economic conditions." The average mental ages for the respective groups, by Binet-Simon tests, were found to be 9.0 years, and 8.5 respectively, from which are derived intelligence quotients of .67 and .77. Of course, here again the real difference is not quite so great if the error of Binet for the older children is taken into account. Nevertheless, it is obvious that the older group of 11 children, as pointed out by Strong, is appreciably lower intellectually, which fact would presuppose a lower rate of gain by them, which gain was 1.5% as against 5.9% for the younger group. " When the two groups are compared with normal children, we see that the younger children have gained but 34% of what the healthy children accomplished, while the older children have gained but 9%." It should be recalled that this " normal " group had an average chronological age of 11.1 years and mental age of 10.1 years, giving an intelligence quotient of .91. Certainly, therefore, Strong is not justified because the older hookworm children with lower intelligence gain less than the younger hookworm children of higher intelligence, in concluding: *" The longer the child has the hookworm disease the less will be the improvement mentally when the child is treated."* And not justified in spite of the fact that he notes, " Our careful study made of these children (*the 13.5 year old children*) did not reveal any other cause for the retardation than hookworm disease." *Here again he has merely shown by his data that the brighter children learn faster than the duller children, which is to be expected.* Furthermore, it is not clear on what

ground Strong assumes that the 13.5 year old children with hookworm have had the disease longer than the 11.1 year old children.

In 1917 Truman Lee Kelly[9] reported a study in which his results disagree with those of Strong's to the effect that children cured of hookworm improve more rapidly in mental traits after cure than do the normal children.

He too had a small number of cases in the groups compared:

47 children free from malaria and hookworm.
9 children cured of hookworm.
11 children cured of malaria.
11 children cured of malaria and hookworm.

The tests were Starch, Arithmetic, Courtis Arithmetic, Trabue completion and Thorndike Reading tests, which were repeated after a six months' interval. Kelly gives no indication as to the mental status of the group compared at the time of the first test. Furthermore, since he depended upon the children's report as to whether or not they had malaria one is not sure this factor is wholly eliminated from the "free-from-malaria and hookworm" group.

If number of cases were the solution of this problem, the solution should have been near at hand upon the report of Waite's Study,[10] wherein he tested 116 non-infected children, 65 lightly infected children and 159 heavily infected children, with Goddard's Revision of the Binet-Simon Tests, and the Porteus Mazes. Waite classified his group in this way:

"1. The heavily infected cases presenting hookworm ova in plain smear examinations of stools;

"2. The lightly infected cases, presenting hookworm ova only in smears of centrifuged stools; and

"3. The non-infected cases, who showed no ova in four successive stool examinations, two of plain smears, and two of centrifuged smears."

Expressed in mental age the retardations for the respective groups for Binet and Porteus tests were as follows:

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[9] Effect of Malaria and Hookworm upon Physical and Mental Development of School Children. Elementary School Journal, Vol. 18, 1917, pp. 43-55.

[10] Dr. G. H. Waite, A Study of the Effects of Hookworm Infection upon the Mental Development of North Queensland School Children. The Australian Medical Journal Jan. 1919. The original manuscript dated 1918 was loaned the writer through Major John L. Riley, by the Library of the Rockefeller Foundation.

	Non-Infected	Lightly Infected	Heavily Infected
Retarded by Binet...	3.9 mo.	9.3 mo.	23.4 mo.
Retarded by Porteus	2.7 mo.	4.7 mo.	16.00 mo.

Unfortunately Waite computed the average retardation rather than the median, thereby giving undue weight to the extremely low cases. Nevertheless, these data show conclusively that the hookworm children studied are on the average more retarded mentally than the non-hookworm children, and the heavily infected group is more retarded than the lightly infected group. But they do not conclusively support the inferences derived therefrom by Waite, wherein he concludes:

1. "The results bring to light clearly two features, namely, that hookworm infection produces in growing children severely arrested mental development, and considerable mental sluggishness."
2. "The duration of hookworm infection is important, because the longer the infection persist the greater is the mental retardation."
3. "The degree of hookworm infection, and therefore the amount of anemia, definitely influences the amount of retardation of mental development."
4. "The most backward hookworm children invariably give the history of an early infection."

Considering Waite's first point, there arises the ever-present problem in interpretation of such data which he seems wholly to ignore, namely, how is anyone to know from any data which merely shows the hookworm group inferior in mental rating whether the inferiority is due to hookworm or whether because of their inferiority such children were of poor sanitary habits, thereby more exposed to the infection? In other words, to what degree does hookworm select the lower level of intelligence? Certainly Waite is not justified by the data he furnishes in making his first conclusion. On the basis of his data one could infer with just as much logic that "severely arrested mental development, and considerable mental sluggishness" tended to make the children easy victims to hookworm.

The validity of Waite's succeeding inferences hangs upon that of his first one.

In the study of Major Kofoid and Pittenger (see this paper, p. 211), their comparative data expressed in 10% steps from the highest to the lowest for hookworm and for non-hookworm

cases, respectively, indicate an even more pronounced tendency at convergence toward the lower extreme than does this study. Here are their data for Alpha:

			501 Hookworm Cases Aver. Score	4,792 Non-Hookworm Cases Aver. Score
1st	(Highest)	10%	181.0	219.0
2d	"	"	146.6	178.5
3d	"	"	118.6	150.6
4th	"	"	99.0	127.7
5th	"	"	80.4	107.4
6th	"	"	63.5	89.6
7th	"	"	48.7	70.7
8th	"	"	36.1	51.3
9th	"	"	24.6	31.8
10th	(Lowest)	10%	1.0	0.0

Median score.

Although their data were given in weighted scores which are about twice the unweighted scores in the present study, thereby rendering the two sets of data not wholly comparable, yet the general tendency is the same as that shown by our data. Of course their relative inferiority of the hookworm group is very much greater than that for our study, they also found a greater increase of difference from the lowest mental level to the highest. This is to be expected since their negative group was selected at random including troops undoubtedly from the larger urban populations and other non-infected or lightly infected areas, whereas each of our hookworm cases was paired with a non-hookworm case from the same local territory. They also found in accord with our data, that the relative inferiority of the hookworm troops was much greater for whites than for colored and greater also for Alpha troops than for Beta troops.

Interpreting these data Kofoid and Tucker say: "In literate blacks the difference is less, as might be expected, because of a relative racial immunity." They conclude:

"The interpretation of the data is that men infected with hookworm belong to all classes of mental rating, but not wholly proportionately in all groups to those without the infection, the men with the low scores showing a greater relative deficiency as the score falls. It also appears that the infected men are pushed *en masse* below the normal by infection by hookworm, or by other factors correlated therewith in a vicious

circle, but that the men with lower scores have a greater momentum and move relatively farther from the norm than do infected men with higher scores. This suggests the conclusion that men with hookworm include a greater proportion of subnormal types than men without and that subnormal men tend to acquire the disease more rapidly than men of higher categories. It is also possible that the intensity of individual infections may be heavier in the groups of lower intelligence, due to the relation of intelligence to sanitation, which in turn modifies the chances of infection and thus the ultimate intensity thereof."

As for the negroes, they logically fit into the lower order, consequently showing, as do the lower whites, a comparatively small inferiority for the hookworm group. Then the question may arise why is not the convergence consistent from the highest to the lowest extremes of intelligence instead of a rather sudden convergence toward the lower extreme? The answer may be that with the exception of the lowest 30 or 40% of the intelligence scale of a community, there is hardly to be expected a great improvement in sanitary habits near the more intellectual extreme. Certainly the degree of rise in standards is hardly proportional all the way upward. On the other hand, just why should the very upper extreme of the hookworm and non-hookworm groups be actually closer than the mean where there is a slight bulging in the space between the curves? Undoubtedly this is due to a failure of Alpha to differentiate as widely in intelligence scores for the upper extremes of intelligence. In the numerous studies of Alpha by the Division of Psychology it was invariably found that, on the basis of a man's military value, Alpha did not clearly discriminate between the upper and lower A grade man, nor even always between the A and B man.[11] Furthermore when given to college men, the discrimination in terms of intelligence rating is certainly not very pronounced.[12]

On the other hand, the convergence at the lower extreme may mean that hookworm disease in some peculiar way does not affect persons of very low mentality or even those of very high mentality or that the effect is so small as to be registered but slightly or not at all by an intelligence test. In this event the difference between the hookworm and non-hookworm groups would undoubtedly be due to hookworm infection.

If two groups, say from northern states where hookworm

[11] Psychological Examining in the United States Army, Part III. P. published by the National Academy of Sciences, Vol. XV.

[12] School and Society, Vol. X, No. 250, pp. 437-440.

is practically absent, whose median mental status were known to be quite disparate, were compared on the basis of 10% steps, comparison with such data would help clear up the difficulty in interpreting the lack of complete parallelism between the 10% steps of the hookworm and non-hookworm groups of this study.

In reading the data of Table I care should be exercised in interpreting per cents of difference in respect to all mental ratings since a year's difference between mental ages 7 and 8 years cannot mean the same as a year's difference between 11 and 12 years, nor in terms of per cent, since even in spite of intelligence scales there is no certainty that the increments in terms of mental age or even in terms of Alpha or Beta scores are constant. Let such per cents merely be read as ratios to the higher values compared and no more.

Relation of Schooling to Hookworm

When the amount of schooling reported is considered the data are no more conclusive in what they mean, for very high correlations were found between the army group tests and amount of schooling.[13]

Just what the high correlation between intelligence rating and schooling means is not certain, i. e., one does not know how much schooling offsets ability to score in the army tests nor to what degree the amount of native ability determined how long school had been attended. In this study exactly the same problem arises: Did hookworm disease decrease the amount of school attendance or was the kind of children whose school attendance was limited, of those children who most readily fell heir to the disease? Maybe such children were those less likely to have shoes and not having so much schooling and not coming perhaps from so good a social environment would not have developed so good sanitary habits.

Relation of Age to Hookworm

Since all the troops from among whom the cases selected were of practically the same age distribution, it is quite significant that the hookworm troops are from .7 to .9 of a year younger than the non-hookworm troops.

According to the report of the Porto Rico Commission,[14] there was found the following age distinction:

[13] Psychological Examining in the Army, Part III. National Academy of Sciences, Vol. XV.

[14] Ashford and Jgaravidez, Uncinariasis in Porto Rico, Sen. Dec. 808, Washington, D. C., 1911.

Age	*Cases*
Under 10 years	15,622
10 to 20 years	50,924
21 to 30 years	36,589
31 to 40 years	18,254
41 to 50 years	8,796
51 to 60 years	3,841
Over 60 years	1,413

Although the cases examined were not exactly a random sampling, these figures doubtless represent the approximate age distribution, and are slightly suggestive of a corroboration of our findings.

A study reported by Major Siler and Major Cole in 1917 is more to the point.[15]

Of the First Mississippi Infantry 32% were infected, and the First Alabama Cavalry, 54%. The age distribution for the highest 10 years were as follows:

Years	*First Mississippi* %	*First Alabama* %
16-17	1	2
18-19	21	42
20-21	32	24
22-23	20	12
23-24	11	7

Obviously the First Alabama Infantry, a greater per cent of whose troops have hookworm, are younger than those of the First Mississippi. In the light of these data the writers inferred (p. 95):

"In our opinion there is but little or no doubt that age accounts to some extent for the greater prevalence of both hookworm disease and measles in the First Alabama Cavalry."

From this data and from the present study (see plate 25-28) it seems that the younger troops are more susceptible to hookworm disease than the older troops. Certainly more data is desirable as to the exact distribution of hookworm cases on the basis of total population at various ages and in various racial levels. However, it is also probable, since hookworm infection is limited in its length of life within a given individual, that many of the older men, who, in the hookworm

[15] Major J. F. Siler, M. C. and Major C. L. Cole, M. C., The Prevalence of Hookworm Disease in the Fourth Texas Infantry, First Mississippi Infantry, and First Alabama Cavalry Regiment. The Military Surgeon, 1917, Vol. 41, pp. 77-99.

survey fell into the non-hookworm group, had once been hookworm cases but had become free from hookworm at some time previous to the hookworm examination.

Conclusion

The average person of a given community, who is infected with hookworm, is inferior mentally to the average person, of the same community, who is not infected with hookworm. In support of this statement conclusive data have been presented.

But there are yet no data available to show conclusively whether this mental inferiority is due to hookworm disease or whether hookworm disease is due to mental inferiority.

A fact not calling for evidence here is that hookworm disease is a social and economic burden upon tropical and subtropical countries. Now if it does not in and of itself lower the mentality of its victim, there is ample evidence that it will, as will any other disease, diminish his educational opportunities, and thereby his efficiency as a social unit.

Since because of the very nature of the transmission of hookworm disease, wholly dependent upon remedial sanitary habits and conditions, doubtless it is true that just because of lower intelligence or lower mental training the victim more readily falls heir to the disease; hence the obvious remedy is more education to the educable, a far stricter governmental guardianship over the non-educable and over those educable to but a slight degree, and an aggressive general governmental control over the social habits and sanitary conditions of the community. In matters of education, mere ability to master the three R's should not be the goal alone, but through this median specific instruction in matters of simple rules of health and sanitation is of imperative necessity.

This emphasis upon specific hygiene instructions is obviously none the less imperative if it is discovered that the hookworm infection is primarily the cause of the relatively lower mental status of its victims.

So, then, whether hookworm disease is the cause of mental inferiority or the result, or both, the fact that those infected with the disease are, as a rule, distinctly inferior to those free from the disease, as shown conclusively by this study, is an inexorable challenge to the federal, state and local leaders in matters of health education and general economic and social betterment, to use every possible means to rid the country of this pest.

Suggestions for Further Research

The question remaining to be answered is, Does hookworm disease directly depreciate the mental status of its victims?

It has been seen that Strong's method of comparing gains in learning by the cured-of-hookworm children with hookworm children, while on the right track apparently, was fallacious in that it ignored the fact that ability to learn correlates highly with general intelligence; and, that as subsequent studies and as his own data indicate, almost any randomly selected hookworm group will be found to be of lower mental status than a non-hookworm group similarly selected.

It is necessary, therefore, in order to make a fair comparison, to be sure that the groups compared are at the time of the first learning test of practically the same mental ability with practically equal distribution of abilities in the groups compared.

Furthermore, the social status of the compared groups should be equal. A study of infected and non-infected children of the same family (especially of twins) would meet both conditions fairly well. That the social status be equalized in such cases would be obvious and that twins show far closer mental resemblance than siblings and siblings far closer resemblance than randomly selected children, has been well established by Galton,[16] Thorndike,[17] Rusk,[18] Cobb,[19] Starch,[20] and others.

In the absence of either class of subjects to be studied, the group intelligence tests available would enable the selection of groups of practically the same mental abilities.

If, then, of those two groups, the hookworm group learned appreciably more slowly than the non-hookworm group or cured-of-hookworm group, the obvious inference would be pretty safe.

The learning task should extend over a period of several weeks or months including numerous practices, thereby offering opportunities to measure mental endurance and attitude toward a task whose novelty has worn off and wherein the stimulation of a stranger as examiner has ceased to function as a stimulation.

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[16] Sir Francis Galton, History of Twins, p. 170 f of the reprint in Everyman's Library.

[17] E. L. Thorndike, Measurement of Twins, Archives of Philosophy, Psychology and Scientific Methods No. 1, 1905.

[18] Elizabeth Rusk, Mental Resemblance among Siblings. Teachers College, 1908, Masters Thesis, (unpublished)

[19] Margaret V. Cobb, A Preliminary Study of the Inheritance of Arithmetical Abilities. Journal of Educational Psychology 1917, Vol. 8,—pp. 1-20.

[20] Daniel Starch, The Similarity of Brothers and Sisters in Mental Traits. Psychological Review 1917, Vol. 24, pp. 235-238.

Assuming that the infection does not depreciate the mental organism structurally, even then in terms of attitude there would remain the question of functional depreciation. It is desirable then to devise a test to measure the attitude of the learner toward his task. Admittedly this is difficult of measure, yet, the difference in the learning gains by two groups who on setting out upon the task are of equal intelligence, should be a fairly good measure.

Suppose, for example, two such groups are tested at a given time and after, say six months, are retested, and show the same gains. Even then their learning abilities under normal procedure may not be proved equal; for if on the other hand the test had been repeated 75 times on as many days or if the children had been at regular school work with their teacher, the one group may have lagged in interest far more than the other.

Certainly the factor of attitude and of stimulation under peculiar conditions have not been carefully taken into account in some of the widely read experiments whose data seem to show, for example, that rebreathed but circulated air is quite as good for the child's mental function as freshened air or that there is no such thing as mental fatigue or that certain drugs have little or no impairing effect on mental functioning, when they offer no such conclusive proof at all.

Professor James, somewhere, has pointed out that few persons work up to the limit of their capacity; J. J. B. Morgan,[21] that subjects lifting weight not visible, by means of pulleys, tend to lift with the same speed, within certain limits, regardless of the intensities of the weights. It has been shown[22] that learners continue to improve under intensive practice to a very remarkable degree under stimulation of rivalry. In another study[23] the writer has shown that by learning against time, the ordinary learning record can be improved to surprising degree.

A learning test, then, over a long period of time, with many practices, on members of a large hookworm group compared with similar data on a large non-hookworm group, both of practically the same mental and social status at the beginning of the test, with the diagnosis and cure of the disease under control, should yield a definite answer to the question of the mental influence of hook worm disease.

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[21] J. J. B. Morgan, The Overcoming of Distraction and other Resistances. Archives of Psychology #35, Science Press.

[22] Garry C. Myers, Hazel Coburn, Helen Collins, School and Society 1918, Vol. 8 pp. 597-600.

[23] Garry C. Myers, Learning Against Time. Jr. Ed. Psychology, February 1915, pp. 115-116.

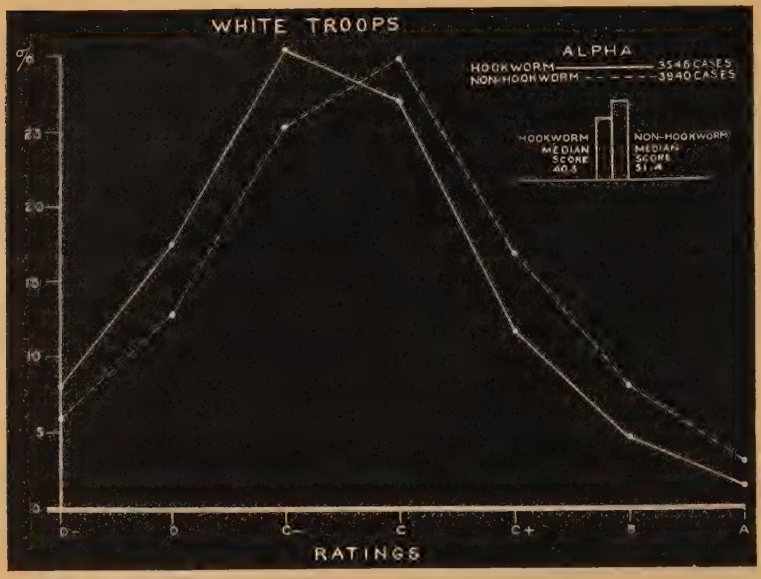
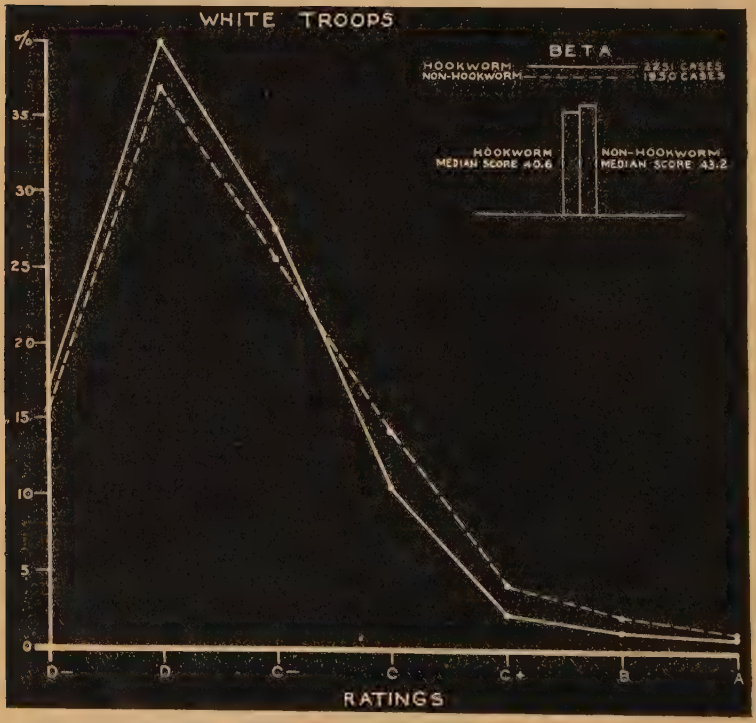


PLATE 1



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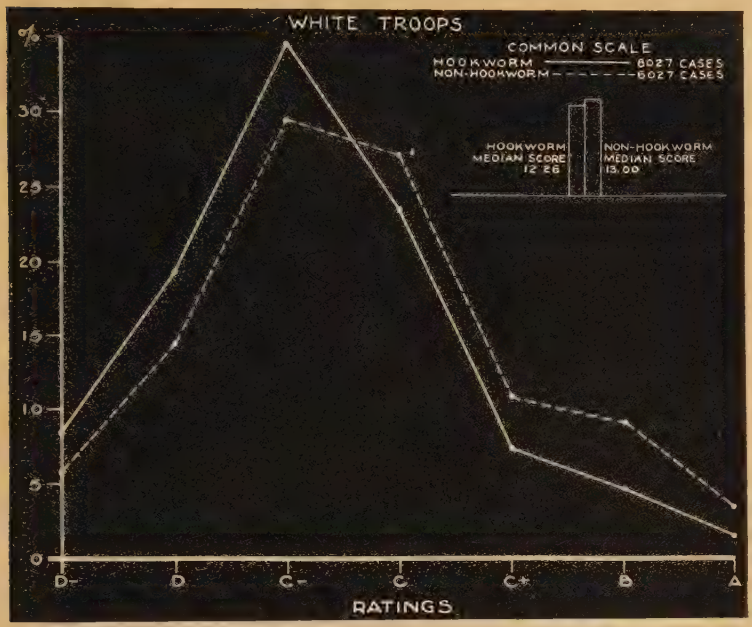

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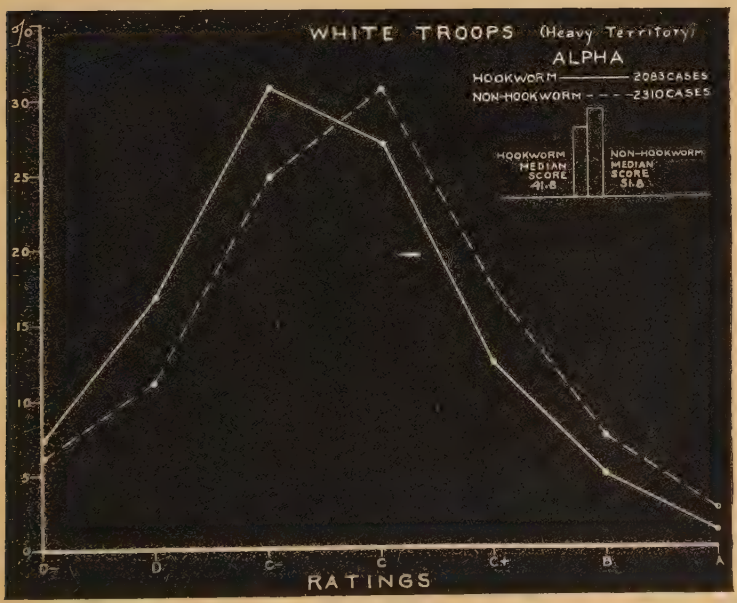

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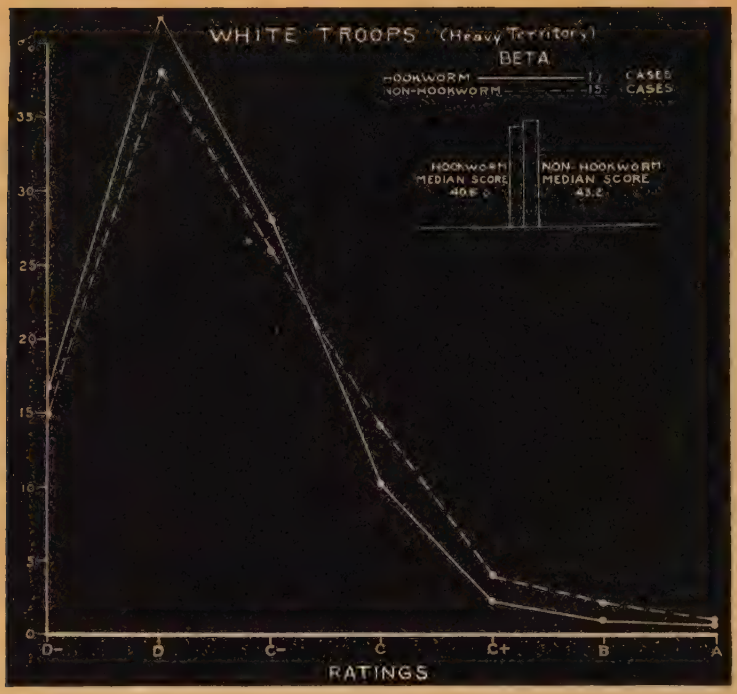

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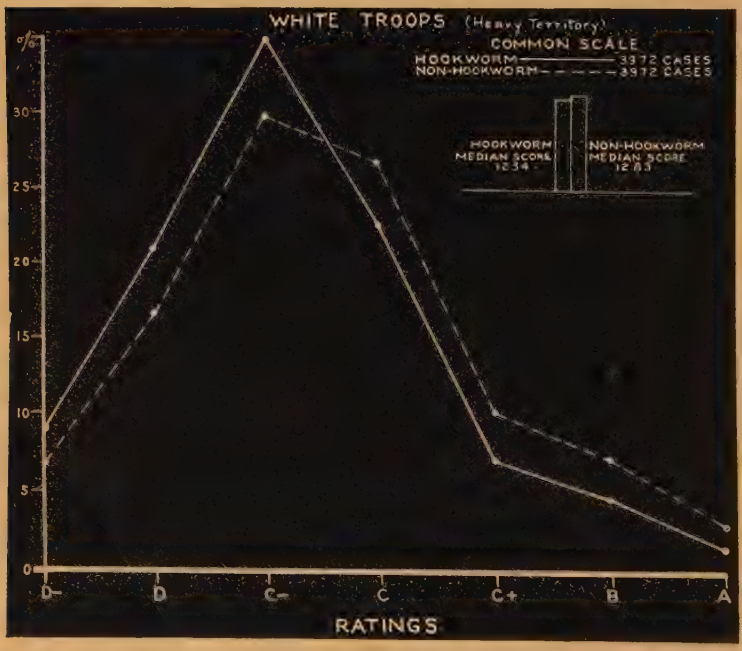

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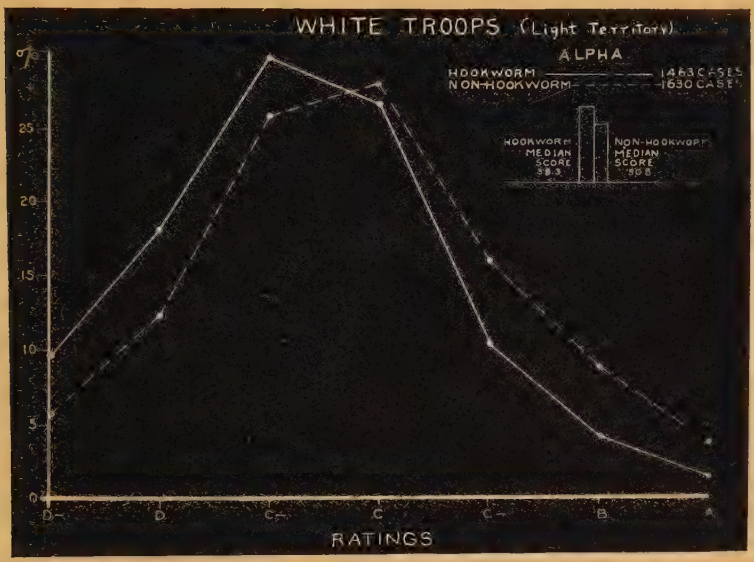

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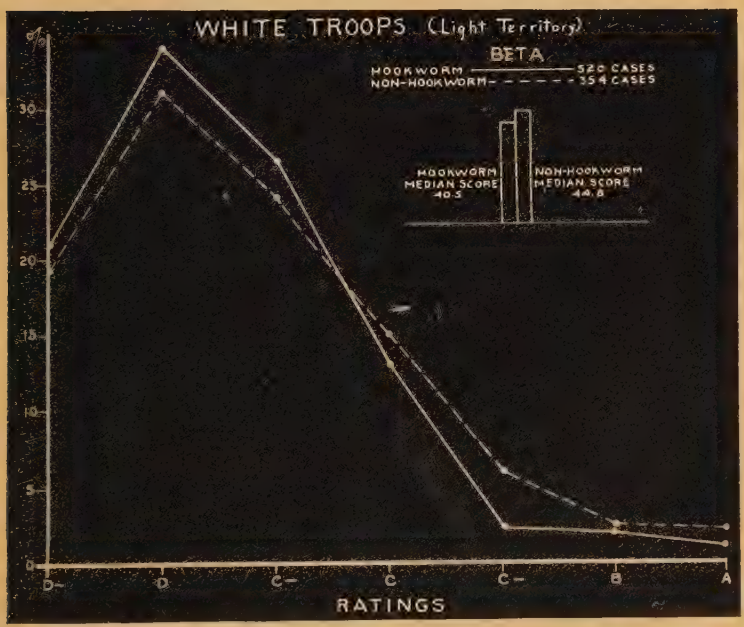

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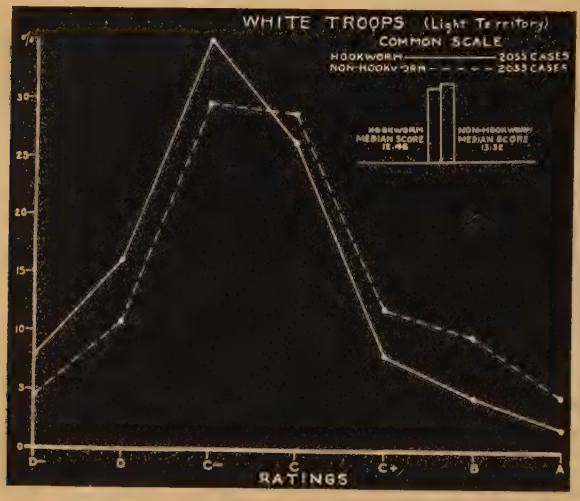

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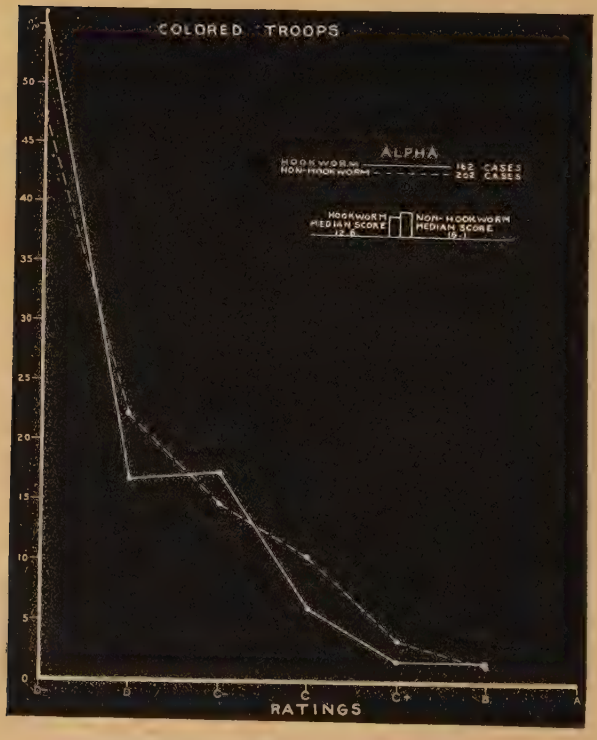

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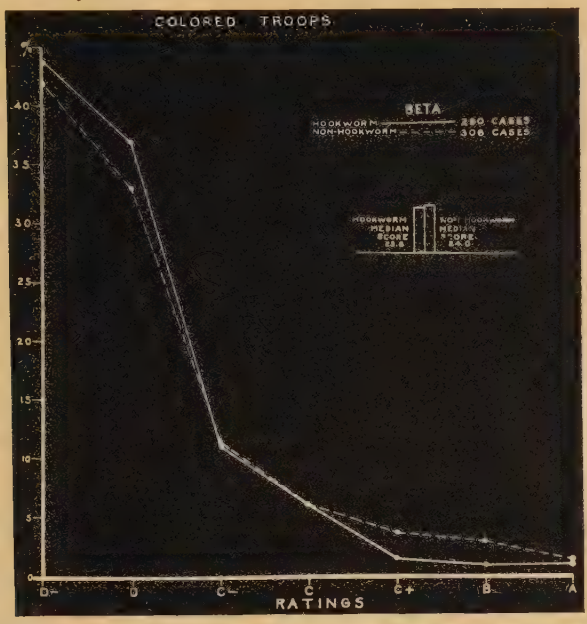

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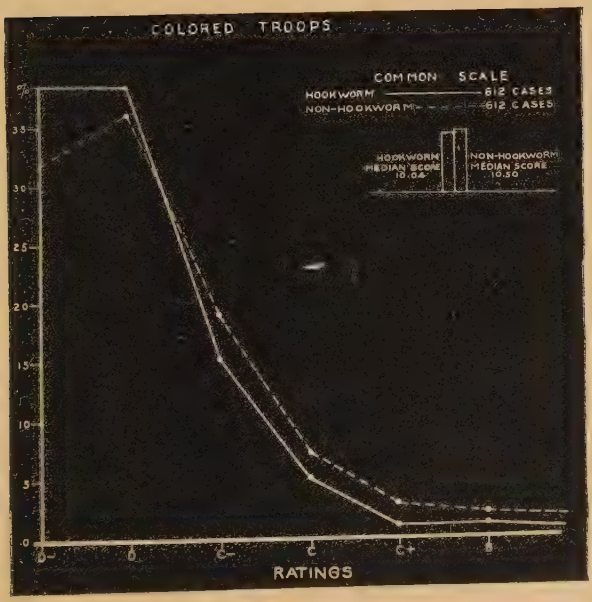

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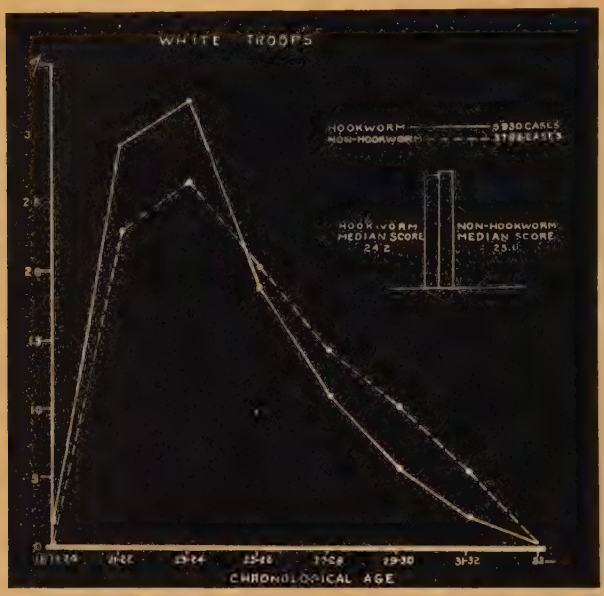

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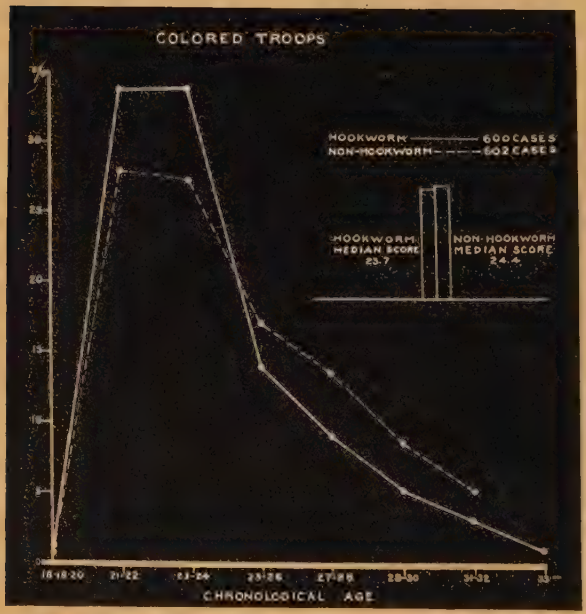

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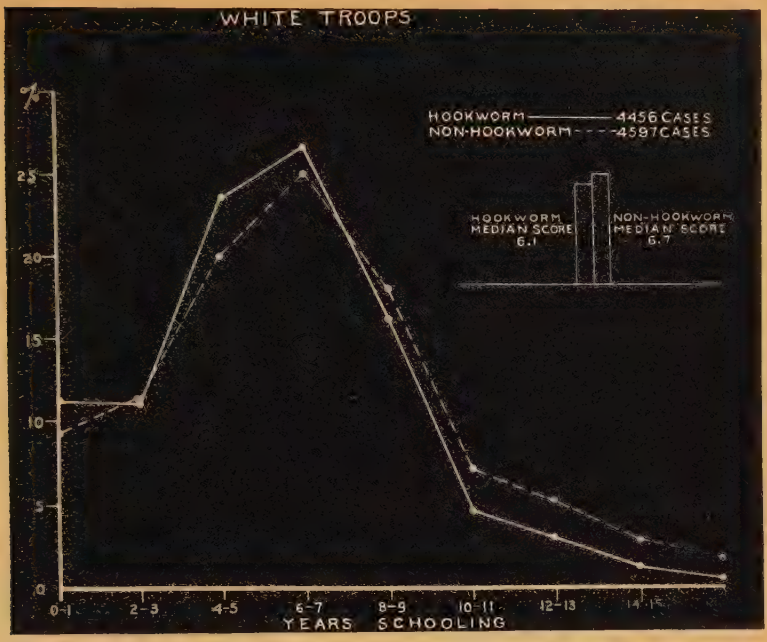

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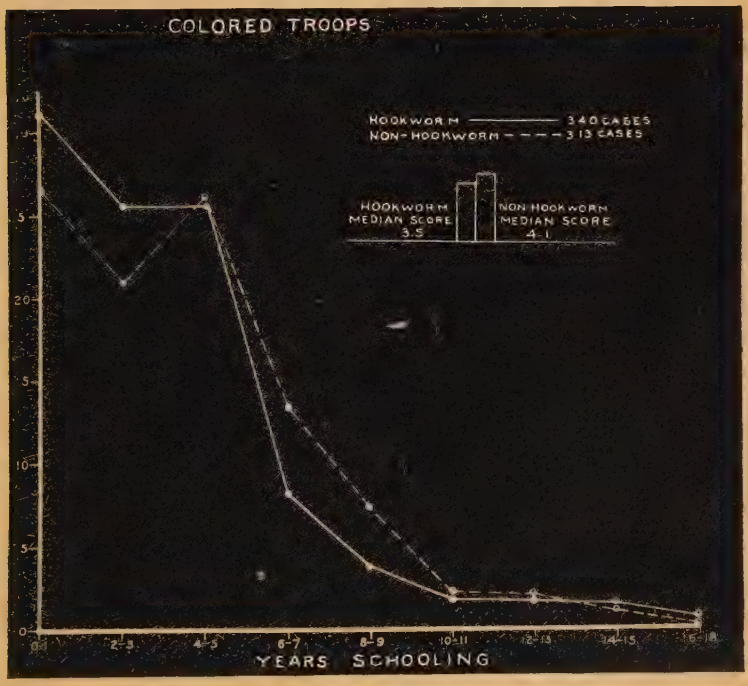

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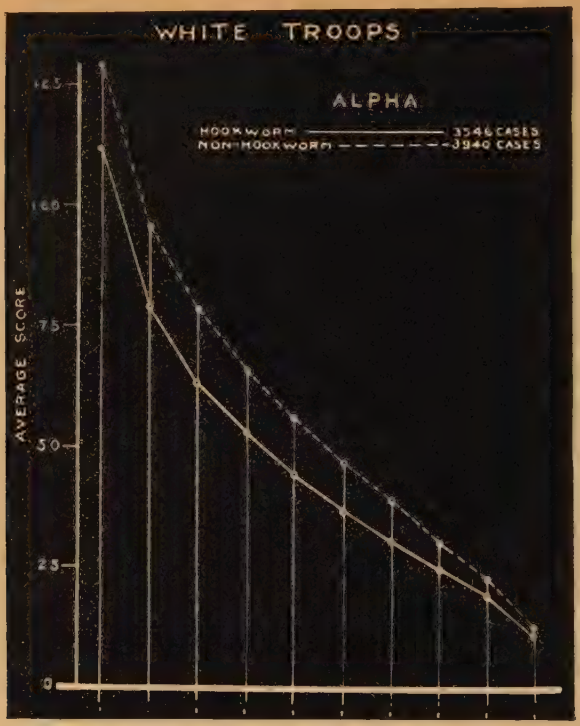

PLATE 17

SUCCESSIVE TEN PER CENT GROUPS

Highest 10%	2nd 10%	3rd 10%	4th 10%	5th 10%	6th 10%	7th 10%	8th 10%	9th 10%	Lowest 10%

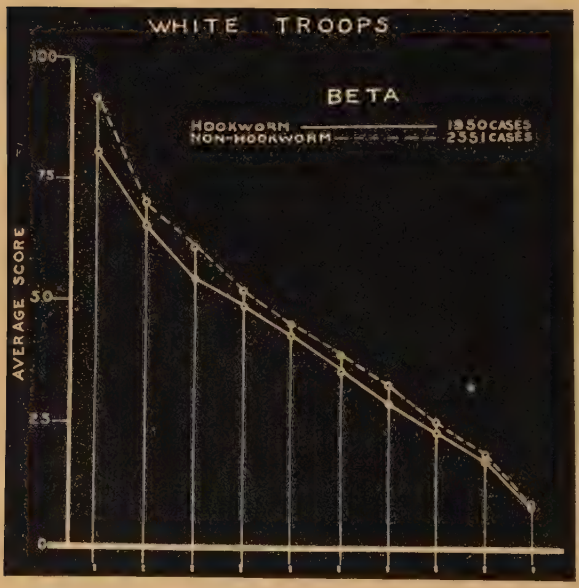

PLATE 18

SUCCESSIVE TEN PER CENT GROUPS

Highest 10%	2nd 10%	3rd 10%	4th 10%	5th 10%	6th 10%	7th 10%	8th 10%	9th 10%	Lowest 10%

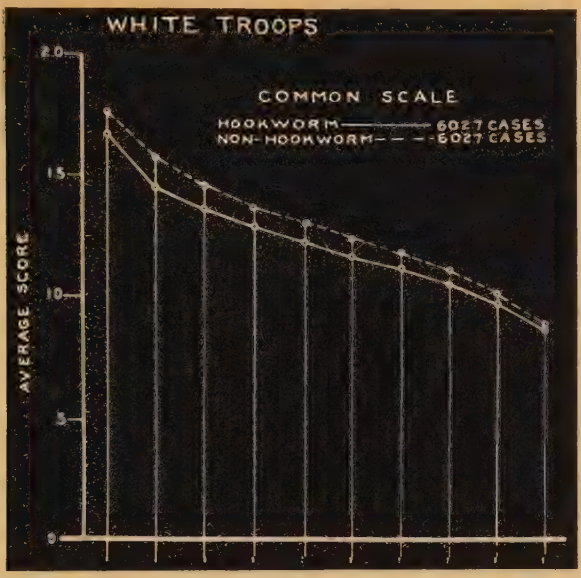

PLATE 19

SUCCESSIVE TEN PER CENT GROUPS

Highest	2nd	3rd	4th	5th	6th	7th	8th	9th	Lowest
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

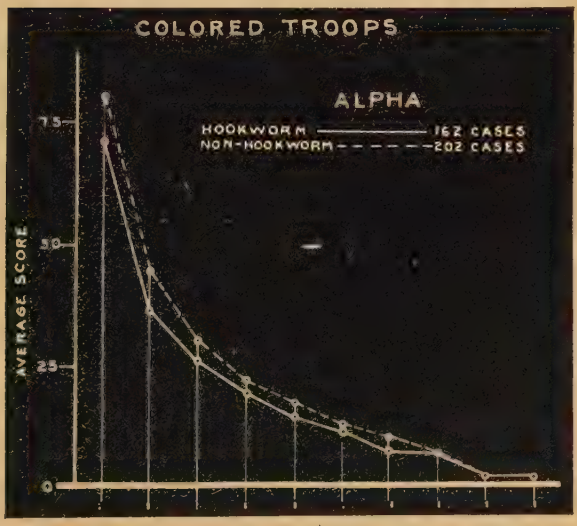

PLATE 20

SUCCESSIVE TEN PER CENT GROUPS

Highest	2nd	3rd	4th	5th	6th	7th	8th	9th	Lowest
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

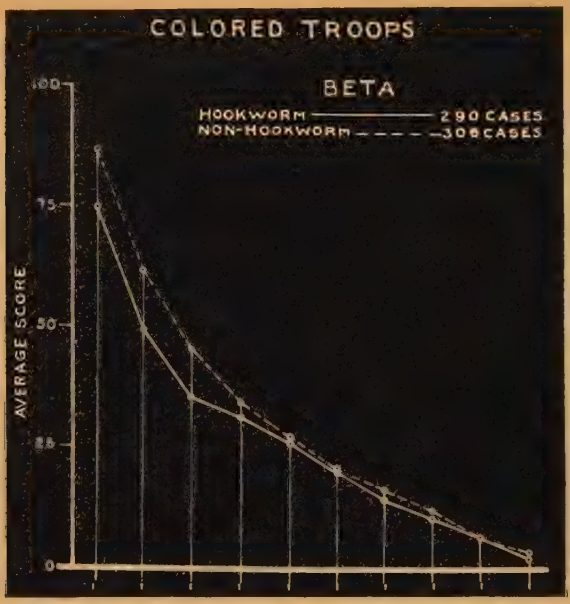

PLATE 21

SUCCESSIVE TEN PER CENT GROUPS

Highest 10%	2nd 10%	3rd 10%	4th 10%	5th 10%	6th 10%	7th 10%	8th 10%	9th 10%	Lowest 10%

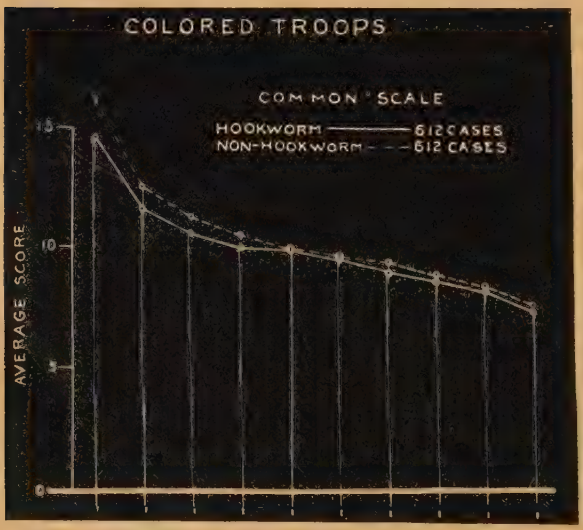

PLATE 22

SUCCESSIVE TEN PER CENT GROUPS

Highest 10%	2nd 10%	3rd 10%	4th 10%	5th 10%	6th 10%	7th 10%	8th 10%	9th 10%	Lowest 10%

THE PSYCHOLOGY OF THE THRILL

By Irving R. Kaiser

Perhaps the most impressive fact that one observes in the study of the history of man is the great difference that exists between what were his most primitive modes of conduct and those of the present time. History has revealed to us facts which show that, in his most primitive state, man's conduct was prompted solely by his instincts and that it was largely impulsive in its nature. In fact, his restrictions in doing whatever he wished were governed solely by his physical power and his skill in protecting himself from an enemy and in securing the gratification of his nutritional and his sexual desires; these three comprised what were the main factors of his life. The constant danger that attended his survival caused him to be in more or less of a continual state of heightened excitement of both mind and body. It was only when he was overcome by physical exhaustion that he relaxed his vigilance and sought rest. Judging from their findings in the study of the human body, scientists have come to the conclusion that man led such a mode of existence for many thousands of years, and while perceiving that his bodily development was ideally suited for the life he led, at the same time they have noted that it is not altogether adapted to his present customs of living.

When we come to consider the reasons why the human body is not well adapted to our present customs of daily living, we note that it is due to a marked *contrast* between what were man's former ways of daily life and the ways of life in the present times. Whereas formerly his conduct was prompted solely by his instincts, in our present times it is prompted by precedent and tradition.[1] His impulsiveness of action has been

[1] Trotter calls our attention to the fact that, even in our present degree of civilization, man's behavior is seldom guided by "rational" motives, using this term in the strictest sense of its meaning. He says that in most instances man is prompted to act from suggestions, the basis of which are the traditions and precedents of the herd. He mentions that, while the greater part of man's actions are of a non-rational nature, man justifies and maintains them by a process which is termed "rationalization." For a further study of this subject consult his writings.

gradually brought under control of a developed will-power; it has been subjected to a certain degree of repression by the individual. In the stead of a freedom of action to do as he wished, his daily activities are now limited to a more or less systematic routine, with which is oftentimes associated a feeling of monotony. His physical activities have in some instances been almost completely supplanted by the use of his brain in the form of his intellectual work, while in other instances they are limited to certain forms of manual labor. Whereas formerly man was forced by his circumstances to acquire a fair degree of skill in many ways, in the present times he has been forced to acquire a high degree of skill in some special form of work. In the past, man was obliged to protect himself from any enemy by means of a bodily encounter, or by the uncertain means of crude implements, such as a bow and arrow; today he is readily able to protect himself in immediate danger by the use of firearms or, in instances of a less immediate character, he may obtain protection by appealing to civil authorities. In addition, here it is against the present day customs for an individual to assault another, this being considered an offense or crime:—this illustrates, in another way, how civilization has restricted man's physical activities. Again, instead of, as formerly, being forced to enter the wilds in search of his food, today he can readily procure it by purchasing it from others. In regard to obtaining the satisfaction of his sexual desires man has been forced to undergo a marked abstinence. Finally, as a result of all these changes which civilization has forced him to undergo, the heightened state of excitement which was so intimately associated with these former activities has likewise been forced to undergo a change. This change, however, like many of those with which it was associated, is one whose nature is more apparent than it is real, its manifestations being inhibited solely by the presence of a constant process of repression going on in the mind. The stress which this process creates in the nervous system acts as a source of constant dissipation of the nervous energy, producing effects which we recognize in the form of a fatigue, a feeling of dullness, irritability, restlessness, or enervation. At times, this condition of dullness, restlessness, etc., becomes so acute that the individual is forced to seek relief by relaxing his repressive processes and indulging in some sort of exciting activity. As Mrs. Walter M. Gallichan has remarked, "There are primitive instincts of tremendous power, which, held in check by our dull and laborious yet sexually-exciting civilization, break out at times in many individuals like a veritable monomania."

Again, certain forms of exercise, golf, tennis, fishing, hunting, etc., owe their fascination to the fact that they are activities which, in a way, resemble those of man's more primitive lifetime. The use of alcohol and narcotics also serves to relieve the repressive influences, and, as Trotter expresses it, they afford "a means of securing, for however short a time, some way out of the prison-house of reality back to the Golden Age." Havelock Ellis has gone so far as to say that "even pain may be welcomed on account of the emotional waves it calls up, because it 'lashes into movement the dreary calm of the sea's soul,' and produces that alternation of pain and enjoyment for which Faust longed." In each instance here, whether it be sexual indulgences, various forms of play, the use of alcohol, narcotics, or the undergoing of pain for the sake of its stimulating effects, we are describing means whereby an individual is seeking to attain relief from the effects of this constant repressive action going on in the brain.

Since we are dealing with activities here in which the brain is the central or chief organ concerned, it is best that we first consider in a brief way the requirements of cerebral functioning.

Briefly mentioned, these requirements are oxygen, nutrition, and an abundant circulation of the blood. As long as these are of sufficient quantity and quality, the brain functions normally. Should any of these three factors become altered in the slightest degree, the alteration produces an immediate effect upon the brain. At the present time we lack means of sufficient delicacy to detect the more subtle derangements of function that occur, and the thrill manifestations, with which the present paper deals, are offered as being perhaps the most delicate of those means that we have at the present time. In a general way, however, we may say that all disturbances of cerebral functioning are brought about by the fact that the catabolic processes that occur with cerebral functioning exceed the anabolic processes; the utilization of nervous energy exceeds the power of the elaboration of this force.

Hence, when any portion of the brain is undergoing sustained activity of an intense degree, that portion rapidly becomes fatigued as the result of not being able to maintain a balanced metabolism. We must bear in mind here that each nerve cell within the body functions individually, as regards its specific energy, and that it is necessary that there be a certain amount of stored energy within each cell in order for it to function. It is due to the fact that the nerve cell cannot store energy as fast as it can utilize it that a disturbance in its functions is brought about. It is in this way that we can

account for the localized disturbances that occur, as well as the general disturbances. In addition the function of nerve cells may be disturbed by deleterious products of metabolism, created in the body and brought to them in the blood stream.

In the study of metabolism we find the relation of oxygen, nutrition and the circulation to be so intimate that a primary disorder of any one of them produces a secondary disturbance of the other two. Since in the present paper we are dealing with conditions where there is a disorder of metabolism, the subject of normal metabolism will not be considered. For convenience of description the factors of nutrition, circulation, and the oxidative processes will be considered under the general term of "defective systemic oxidation." This term will include not only the consideration of conditions where the disturbance is the result of an excessive oxidation, as in fatigue, but will likewise be used in describing those conditions where the disturbance is due to a diminished oxidation, as in diabetes, the auto-intoxications, etc.

Defective systemic oxidation may vary in its nature from a mild, transient condition following intense mental activity to a pronouncedly developed chronic condition such as we note in epilepsy, diabetes, etc. It is in its mild transient form that we first notice its relation to thrills.

In this form we find it associated with certain mental symptoms of restlessness, dullness, irritability, etc. There is a craving for excitement, a change of some sort, or a sense of dissatisfaction, which I term "thrill craving." By the term "thrill," here, is meant a momentary heightened state of bodily excitement, associated with a marked increase in the blood pressure and an intensely increased circulation of the blood. Physiologically, its purpose is to enhance the systemic oxidation; psychically, its effects are to produce a sense of well-being. The intensity of the thrill is governed by the general bodily tone of the individual. Likewise, whether or not the thrill is associated with a feeling of exhilaration or of strain depends upon the individual's general bodily tone. All thrills must be looked upon as being attempts at physiological adjustment, as attempts towards enhancing an individual's sense of well-being. They may occur as an unconscious process, as a response to a sudden objective stimulus; or they may be consciously and deliberately sought. In those diseases with which a pronouncedly developed defective systemic oxidation is associated thrills may serve as indicators of the individual's condition, as to whether or not he is improving or growing worse.

Although thrills are the manifestation of a single force,

vital force, acting in different conditions, for the sake of analysis they may be empirically divided into four elements, as follows:—positive and negative, which pertain to the sensory aspects of thrills; active and passive, which pertain to the motor aspects of them.

If the thrill experienced be accompanied by a feeling of pleasure, we may say that it contains a positive element.

Should the thrill experienced be accompanied with a feeling of stress or pain, we may say that it contains a negative element.

When the thrill is produced by the individual in an active initiated way, it may be said to contain an active element.

Finally, where the thrill is experienced in a passive uninitiated way, we have the presence of a passive element.

Just as we know that in the body every action occurring in the nervous system must have both a sensory and a motor manifestation associated with it, in an analogous way this same factor is true of thrills. Every thrill must have either a positive element associated with an active or a passive one, or a negative element likewise associated. In this way we may say that there are four types of thrills to be found occuring in the body, these being positive active, positive passive, negative active, and negative passive.

However, I wish to mention here that one type of thrill may shade over into another type and that this may be an occurrence that can take place immediately or by a process of graduation, according to the changes that occur in stimulation and the relation of these changes to the individual's general bodily tone at the time of the change. There are no instances where we may witness the presence of one type of thrills as a constant manifestation, though we are able to observe the predominance of a manifestation of one type over that of other types, a fact which is of importance in a diagnostic way.

For example, if an individual's general bodily tone is of sufficient strength to react to a stimulus without strain, we find the individual responding to this stimulus by a positive active thrill. Should the individual's general bodily tone be slightly less than enough to respond with a positive active thrill, we find him manifesting a positive passive thrill. When the individual's general bodily tone is not sufficient to react without great strain, we find him responding with a negative active thrill. Finally, if the individual's general bodily tone be too weak to manifest a negative active thrill, he will respond with a negative passive thrill; which, as we note here, indicates that this last type of thrill is always associated with the weakest degree of general bodily tone. In every instance

we must bear in mind that thrills are always to be considered as being attempts at physiological readjustment and that the purpose of this physiological readjustment is, in some instances, to attain a feeling of physiological well-being and in other instances to regain this feeling of physiological well-being when its presence is threatened. Further, we must consider the "ideal of physiological well-being" as representing the guiding principle of not only the intellectual activities of the mind but also of the physiological activities of the system generally.

It is by virtue of the former that we seek *to attain* this ideal of well-being; it is by virtue of the latter that we, in an instinctive way, seek *to regain* this ideal.

When we come to classifying the various forms of human activities in their relation with the four types of thrill manifestations, we find that every form of activity has a more or less distinct relation to one of these four types. All that one has to do in order to recognize which one of the four types of thrills a certain form of activity is a manifestation of, is to analyze the activity in relation to the two elements of which every thrill is composed.

Positive active thrills, as I have shown, are those that are produced by an individual in an active initiated way and afford a sense of pleasure to the individual. Dancing, certain forms of gymnastic exercises, golf, tennis, hunting, fishing, etc., are all instances of activities that afford a means of obtaining positive active thrills. Again, the performance of some artistic form of work, such as music, painting, sculpture, etc., afford a means of obtaining positive active thrills. In recent years modeling in concrete and in clay, structural iron work, basket weaving, and varous forms of handicrafts have been used in some sanatoriums in the treatment of nervous ailments. The beneficial effects that they afford may be attributed to the fact that they are positive active thrill-producing factors. Again, excessive sexual indulgences, masturbation, etc., which are very prevalent manifestations in our present times, may be attributed to the fact that they afford means of positive active thrill production. Finally, the presence of marked sexual excitement in persons who are subjects of tuberculosis and of senile dementia may be accounted for by the fact that it is a ready means of positive active thrill-production. Hartenberg calls our attention to the presence of this same condition of sexual excitement occurring in neurasthenics and mentions that it is sought for the reinvigorating effects that it temporarily produces. It may be considered as merely one form of positive active thrill-producing activity akin to those mentioned in re-

gard to tuberculosis and to senile dementia. Positive active thrills have a predominating "motor" character, and since this feature has a therapeutic value, it is well to bear it in mind.

Positive passive thrills, as have been shown, are those that are produced in an individual by a pleasantly affecting objective stimulus in a passive uninitiated way. Owing to the fact that the individual is acted upon, this type of thrills is associated with less of a sense of effort than is the first mentioned type, and for this reason they are probably the more frequently observed of the two types. The fascination of moving pictures, vaudeville shows, witnessing of ballet dancing or of beautiful works of art, listening to musical concerts or to lectures, etc., is due to the fact that these stimuli produce positive passive thrills in us. While not altogether omitting the importance of hunger in regard to the enjoyment of eating, it may be said that oftentimes the presence of flavor, piquancy, daintiness, etc., serve to produce a distinct positive passive thrill in some persons.

Again, tea, coffee, tobacco, alcohol, and narcotics owe the attractiveness that they hold for some people to their positive passive thrill-producing qualities. The widespread use of perfumes by women is due in no small degree to the fact that they serve to create positive passive thrills. The various forms of gambling that are so commonly witnessed in our present times may readily be seen here to owe their attractiveness largely to the positive passive thrills which they produce. The reading of novels and of many other types of literature is due largely to the fact that they serve to create positive passive thrills. Day-dreaming may be attributed to this same cause. Probably the best indication that beneficial effects are following the use of massage or of hydrotherapeutic treatment is the feeling of a positive passive thrill afterwards. If this is lacking upon the completion of the treatment, it is doubtful that beneficial effects are being derived.

It is advisable to note here that while all the various forms of positive passive thrill-producing stimuli that have been mentioned so far are ones that are usually sought by an individual in order to have some sort of stimulating diversion, there are two forms of activity which, while producing positive passive thrills, are not directly sought by an individual. What are referred to here are abnormal phenomena that occur in epilepsy and in hysteria in the way of convulsions. L. Pierce Clark mentions that, "On careful inquiry one finds not a few epileptics who are not only little concerned about the continuance of attacks, but, if not preceded by an aura with its feel-

ing of oppressive anxiety, they do not particularly dislike having them. Often attacks are desired because they release the individual from the extra nervous tension he feels when a free period longer than usual intervenes. Moreover, in not a few instances one finds epileptics who actually say they take pleasure in having seizures." Havelock Ellis, discussing hysteria, quotes Ashwell as having remarked, "A lady whom I long attended always rejoiced when the fit was over, since it relieved her system generally, and especially her brain, from painful irritation which had existed for several previous days." Upon first thought it might appear that the classification of these convulsive phenomena as positive passive thrills is incongruous, especially since these convulsive phenomena are always found associated with a markedly lowered bodily tone and are most often found to occur subsequent to what the individual feels as an unpleasant stimulus.

Were it not for the fact that convulsions are states of unconsciousness we might readily surmise here that the individual would react with either a negative active or a negative passive thrill under given circumstances. The unconscious nature of a convulsion spares, however, an individual from experiencing these last two mentioned types of thrills, and when he regains consciousness he feels a certain degree of exhilaration or physiological well-being. Therefore, it is this conscious feeling of exhilaration, which follows a convulsive seizure, that has influenced me to classify epileptic and hysterical convulsions as being positive passive thrill-producing phenomena. We must look upon these convulsive phenomena in a way similar to the condition that we find present in individuals under the influence of narcotic drugs. Just as we know that narcotised individuals are capable of experiencing positive passive thrills from stimuli that under other circumstances would be intolerable, in a similar way we may say that a convulsion serves to make itself tolerable and, oftentimes, a desired occurrence, since it affords, like narcotics, a means of enhancing the state of physiological well-being.

In contrast to positive active thrills we note that positive passive thrills show a predominating "sensory" character. Oftentimes, because of this factor, positive passive thrills serve by their stimulating effects to arouse sufficient energy to cause an individual to seek experiencing positive active thrills. A notable example of this is the phenomenon of artistic or of inventive "inspiration." Also, as a result of an increased exhaustion of the nervous system which follows the first exhilarating effects of thrills we may find an individual reacting to a given stimulus with a negative active or a negative passive

thrill, depending upon the degree of exhaustion produced. As an example of this, we find a certain degree of irritability following the first exhilarating effects of sexual indulgences.

When we come to consider negative active thrills we find that they are thrills of an unpleasant or painful nature brought about by the presence of stimuli which threaten an individual's sense of well-being, and that the individual seeks to destroy, dispel, frighten or remove in some way this objectionable stimulus. While they may be brought about in otherwise healthy individuals by the presence of a stimulus of too intense a nature, more often this type of thrills is found in those to whom ordinary stimuli have an irritating effect; that is, in individuals whose lowered bodily tone either makes them hypersensitive to stimuli or to whom any attempt at reaction causes a stress within the nervous system. The petulance and the tantrums so often observed in the behavior of weak or neurotic children may be cited as examples of negative active thrills. Worry may be considered as being a very commonly observed form of negative active thrill. Other forms of this type of thrills are observed in tyranny, obstinacy, jealousy, envy, irritability, cruelty, etc.

The mildest form of negative active thrills is probably that of grief. In epilepsy one of the most characteristic features of temperament noticed is the anti-social behavior. In all instances where this anti-social behavior is evidenced, whether in epilepsy or in other neurotic conditions, we may consider it as being so many instances of negative active thrill manifestation, directly attributable to the marked lowered bodily tone present.

Much that figures in the way of acts of vice, criminality, and the like, may be readily interpreted as being instances of negative active thrills of individuals suffering from a condition of markedly lowered bodily tone. In fact, these negative active thrills may be considered as being attributable to this condition of lowered bodily tone more often than as being due to any inherent vicious traits of character. In recent years this fact is coming to receive more and more recognition as a causative factor.

We note in negative active thrills a predominant "motor" character of reaction. In contrast to positive active thrills, they are an activity away from a stimulus instead of towards one. This is in harmony with the ideal of physiological well-being, towards which all activities, both internally and externally, are directed.

Negative passive thrills, which we will now consider, may

be said to differ from negative active thrills only in the lack of a manifested activity. This lack of activity may be brought about in two ways. It may be the result of a mental inhibition, or it may be attributed to lack of sufficient general bodily tone. Again, it may be a combination of these two that brings about negative passive thrills. When it is confined to certain forms of activity, either of a mental or a physical nature, the negative passive thrill may be attributed to a localized lowered bodily tone in those parts. Mental inhibition may be looked upon as being a lowered tone of certain involved cells of the brain; just as we know that certain physical inhibitions, such as occur in writer's cramp, are due to the lowered tone of the nerve cells involved in producing movements of certain muscles. Whether it occurs in the physical or the psychic realms, this inhibition may be looked upon as being the effects of a similar affection of nerve cells.

This condition of lowered bodily tone, whether general or local in nature, varies from time to time. Moreover, there may exist different degrees of lowered tone in different portions of the body at the same time.

In normal individuals we may find negative passive thrills occurring in the form of acts of embarrassment, bashfulness, timidity, etc., when they are in the presence of a stimulus producing an overly intense effect upon them. In abnormal conditions they may be brought about by ordinary stimuli acting upon a hypersensitive organism, the hypersensitive condition of the organism being due to a lowered bodily tone. It is in this way that the occurrence of certain hysterical phenomena, such as contractures, paralyses, etc., may be accounted for. They are analogous, in a physical way, to the psychic phenomena which we observe in certain forms of behavior, such as obstinacy, apathy, reticence, etc., all depending upon the effects of stimuli upon a hypersensitive nervous system. The lamentations of individuals suffering from melancholia, the hypochondriacal attitudes of mind noted in neurasthenia, and the petulance that is found to be so commonly present in diabetes, may be looked upon as forms of behavior indicative of negative passive thrills. Often times the sexual frigidity occurring in women may be looked upon as being a negative passive thrill manifestation. This last-mentioned phenomenon bears a close resemblance in its nature to hysterical anaesthesia.

In defining thrills in a previous portion of this paper it was mentioned that they were momentary heightened states of bodily excitement, etc. Under certain conditions, thrills may be observed to manifest themselves over a long period of time.

We may consider what is ordinarily spoken of as "delirium" as being a manifestation of a thrill extended over a long period of time. The phenomenon of delirium is always found associated with a markedly defective systemic oxidation which especially affects the brain. The reasons for this defective systemic oxidation having a selective effect here, I will not attempt to offer any explanation of in the present paper. Usually the type of thrill which the delirium manifests is a negative active, as in mania or in dementia praecox. Occasionally, a positive active or a positive passive thrill is evidenced, as in hysteria.

Sometimes a stimulus, when it is of great intensity, will produce a shock or syncope before it can be recognized in the consciousness. However, in those instances where a stimulus is recognized before unconsciousness occurs, it is felt as an intense negative passive thrill of horror.

In order to understand the relation of thrills to emotions it is necessary that we first discuss the relation of thrills to instincts. Just as Havelock Ellis considers that touch is the "sense which is the most ancient and fundamental of all—the mother of the other senses," in an analogous way thrills may be considered as being the most ancient and fundamental of all instincts—the mother of the other instincts. Thrills are closely bound up with the sense of irritability, on the one side, and with the sense of movement on the other; it is an intermediate process occurring between these two phenomena, a sort of nascent activity. Given a certain stimulus by way of an irritability, we may look upon the thrill as being the heightened state of excitement that follows; and here no reference is intended to movements of voluntary musculature but to the internal changes that occur prior to observable movement in the form of instinctive activity. In other words, the particular forms of instinctive activities are all merely expressions of this state of preceding excitement, an excitement of the involuntary nervous system. The instincts may be looked upon as being acquired modes of expression of this excitement. Again, Ribot has expressed the opinion that this excitement of the involuntary nervous system depends "not only on physiological conditions, but still more intimately on the chemical action going on in the tissues and fluids of the organism." McDougall states: "It is probable that every organ in the body exerts in this indirect way some influences upon the mental life, and that temperament is in a large measure the balance or resultant of all these many contributory chemical influences." Freud, in discussing nervous diseases, mentions: "We can hardly avoid perceiving these processes as being, in

the last analysis, chemical in their nature." The researches of Crile and of Cannon have, in recent years, tended to confirm this theory of chemical influences. In fact it is to this chemical influence that the sense of physiological well-being with its associated phenomena of thrill-craving and of thrill-expression may be attributed. Any alteration of the chemical status of the body has an immediate effect upon the sense of physiological well-being. This leads to the creation of thrill-cravings, which in turn bring about states of excitement that are the forerunners of thrill-expression.

Having shown that thrill force is a common component of all instinctive reactions, we will now proceed with the discussion of instincts. McDougall, describing instincts, says: "We may say, then, that directly or indirectly the instincts are the prime movers of all human activity; by the conative or impulsive force of some instinct (or of some habit derived from an instinct) every train of thought, however cold and passionless it may seem, is borne along towards its end, and every bodily activity is initiated and sustained. The instinctive impulses determine the end of all activities and supply the driving power by which all mental activities are sustained, and all complex intellectual apparatus of the most highly developed mind is but a means towards these ends, is but the instrument by which these impulses seek their satisfaction while pleasure and pain do but serve to guide them in their choice of means." While admitting that pleasure and pain serve as guides to instinctive activity, their rôle in the instinctive activities is not limited to this function alone. Not only do pleasure and pain serve to guide the instinctive activities but they accompany them throughout their course of action. As McDougall further remarks: "We seem justified in believing that the continued obstruction of instinctive striving is always accompanied by painful feeling, its successful progress towards its end by pleasurable feeling, and the achievement of its end by a pleasurable sense of satisfaction." We may presume, here, that McDougall has reference to the expression of instinctive striving being inhibited by a process of mental repression. In accordance with the thrill theory, however, these instinctive activities may have an accompanying feeling of pleasure or of pain the origin of which is due to the condition of the general bodily tone. As have been shown, if an individual's general bodily tone is sufficient, he may respond to a stimulus by a positive passive thrill; if his general bodily tone is low, this same stimulus, by the stress it causes in the system, will cause the individual to respond with a negative active or a negative passive thrill. Here we have the pleas-

urable or the painful feeling depending upon the initial strength of the individual's system and not due to an obstruction of any sort. As Marshall has said, "The activity of an organ of any content if efficient is pleasureable; if inefficient is painful."

If we take our theory a step further we will find that thrills are not only component parts of all instinctive activities but that they are the chief component parts; the parts that constitute the force, of which the instincts are but various forms of manifestation in a motor way. In addition to these instincts, or motor manifestations of this force, we have certain sensory manifestations, these sensory manifestations arising from the feelings of stress produced in the various internal organs in response to a particular stimulus.

What have been termed the "emotions" may be considered as being these sensory components of thrills. Therefore, we may say that the instincts do not cause the emotions nor do the emotions cause the instincts, but that both are merely concurrent phenomena which are manifestations of a common origin, the thrill force. As Marshall says: "We should not speak of the expression of the emotions, nor of emotions as caused by the expressive activities, but of the emotions as the psychic side of these expressions, using this last term broadly." The emotions are merely the psychic translation of the sensory component of the thrill, the awareness of this component in the psychic realms, as distinguished from the physiological realms in which it arises.

Leaving the discussion of the relation of emotions to psychic activities for a few moments, let us take up the consideration of emotions in their relation to organic activities, returning to the former consideration later. Professor Angelo Mosso says: "We are sometimes surprised by a sad or a joyful piece of news. We all know what happens in a state of fear and distress. Physiological phenomena occur that cannot be described. But when we learn suddenly that the news which has troubled us is false, that our fear and distress had no foundation, the internal disturbance does not cease, the physiological phenomena continue in the organism in spite of all efforts of the will to suppress them.

"The investigation of these processes has shown that the seat of the emotions lies in the sympathetic nervous system.

"Before we were born, and for a long time after birth, our life was entrusted to the activity of the sympathetic system and the reflex movements derived from the spinal cord.

"In decisive moments of life, when emotions are most violent, it is just the sympathetic nervous system that comes into

action. The intestines and the smooth muscular fibers contract in order to raise the pressure of the blood and to utilize the blood better for the brain and the muscles.

"The organs of the abdomen and the pelvic cavity are just as sensitive to the emotions as the heart. I have studied the movements of the abdominal organs, the stomach, and the rectum. In the smallest emotions movements of the intestines and stomach always occur.

"The preponderating activity of the sympathetic system in the emotions is so great that the brain effort is not able to suppress it. Many men feel a contraction of the abdomen when they look down from a tower or other high place. These troublesome sensations which are connected with the idea of a possible fall are simply caused by the contraction of the bladder and the intestines.

"We understand now that the constant and fundamental movements taking place in emotions are the movements of the internal organs of vegetative life.

"In order to increase the circulation of the blood in the brain and muscles our bodily machine has to work under a higher blood pressure. This end could be attained only through the sympathetic system, which sends its fibers everywhere to the smooth musculature. During blushing a paling of the skin can be noticed before the blood-vessels expand and the blush proper takes place.

"Whatever the emotions may be, we always see that in these states the blood pressure increases, the heart beats become stronger, and the respiration deeper. These advantageous effects are the same in man as in animals, when they fix the attention, are passionately excited, curious or jealous, or when they run at play or in pursuit of prey."

As we note from the above, Mosso's description of the emotions bears a great resemblance to what has been described as constituting thrill factors. However, in the present paper, emotions are not considered as being the result of these excitations of the sympathetic nervous system, these last being considered as thrill causing factors. It is the sensory feelings associated with these excitations, the feeling of stress set up in the organism, in response to a stimulus, that constitutes the emotion. The actual force that is elaborated in response to a given stimulus we may consider as being used in the muscular activities which we term the "instincts" and in the mental activities of the moment. Further, we may say that all thrills are the same in nature, differing only as to the intensity of the thrill force and the stress created in the nervous system in providing it. If the force is of sufficient intensity it will

cause one form of instinctive behavior; if of another intensity, it will cause a different form of instinctive behavior to occur. An individual may run away from an assailant in the case of the first instance; he may remain and strike in the case of the second instance. Again, if the thrill force is produced without much stress, it will cause one form of emotion to be felt; if it is produced only as the result of much stress, it will cause a different form of emotion to be felt. In the case of the first, a certain stimulus may cause an individual to feel joyous; in the case of the second, it might cause the individual to feel angry. Besides these extremes of manifestations of thrill activities there are a vast number of intermediate forms of instincts and of emotions that may be evidenced in response to a given stimulus.

Various observers have noticed the similarity of organic activities that produce what I have termed the "thrill," and which includes both instinctive as well as emotional factors. As Mosso remarks, "Even a practiced observer is often unable to decide from the gestures and facial expression of an individual whether he is enraged or in a state of greatest joy. . . . Indeed, in great pain and great pleasure we have the same phenomena—trembling of the muscles, secretion of tears, expansion of the pupils, decrease of visual acuity, buzzing in the ears, oppression of the breathing, palpitation of the heart, inability to speak, exclamations, convulsive movements of the diaphragm, etc." He also calls to our notice that attention and muscular exercise produce the same chemical effects and the same fatigue, which shows this sameness of mental and of physical activity in another way, both of which we may look upon as being forms of thrill manifestation. Woodworth mentions that "Cannon calls attention to the fact that the bodily changes in fear and anger are the same, though the emotions are different, and infers that the emotion cannot be wholly a reflection of the bodily state. The bodily state which he has discovered might, indeed, be better correlated with the more generic conscious state of *excitement,* which Wundt has put forward as one of the elementary feelings. Probably this bodily state occurs when the emotion is not strictly either fear or anger. Cannon finds evidence of it in athletes before and during a contest, and in students during an examination, though the conscious state in these cases is probably not exactly either fear or rage; it would be better named zeal, determination, or excitement. Yet it is not at all improbable that minor differences in the bodily condition exist corresponding to these differences in the emotional state, so that the body is

not quite the same in fear as in anger." Woodworth also calls our attention to the similarity of physical phenomena occurring in willing and in anger. In his discussion of "Love and Pain," Havelock Ellis remarks, "Moreover we have to bear in mind the fact—a very significant fact from more than one point of view—that the normal manifestations of a woman's sexual pleasure are exceedingly like those of pain." "The outward expressions of pain," as a lady very truly writes,—"tears, cries, etc.,—which are laid stress on to prove the cruelty of the person who inflicts it, are not so different from those of a woman in the ecstasy of passion, when she implores the man to desist, though that is really the last thing she desires." Ellis also reminds us that, "De Sade has already made the same remark, while Duchenne, of Boulogne, pointed out that the facial expressions of sexual passion and of cruelty are similar." . . . As Krafft-Ebbing remarks, both love and anger "seek their object, try to possess themselves of it, and naturally exhaust themselves in a physical effect on it; both throw the psychomotor sphere into the most intense excitement, and by means of this excitement reach their normal expression." Marshall, discussing the emotions of joy, sorrow, dread and relief, says that they "appear to be coincidents of increase or decrease of general systemic activities; in a very broad sense, therefore, they may be looked upon as different phases of one emotion." He remarks, in discussing the physical basis of emotions in general, that he does not think "it is at all possible to limit the physical activities involved with the emotions to such effects of voluntary innervation or alteration of size of blood-vessels or spasm of organic muscle as Lange seems to think determine them; nor to increase and decrease of muscle power as Fere's results might suggest; nor to such changes, in relation of size and capillaries, in voluntary innervation, in respiratory and heart functioning as Lehmann has observed. . . . For these emotions seem to me to be coincidents of reactions of the whole organism tending to certain results." Marshall's views here are in thorough accord with what has been described regarding thrill phenomena in the present paper—thrills, as have been shown, being responses of the whole organism to a stimulus, and the different emotions merely sensory phenomena of the thrill, and, as has been shown, indicate different degrees of stress of the organism in adjustment or the production of the thrill force.

Having investigated the relation that organic processes have to emotional phenomena, our next consideration will be the

discussion of the James-Lange theory of the emotions in regard to our findings.

In defining emotions, James has written: "The bodily changes follow directly the perception of the exciting fact, and our feeling of the same changes as they occur in the emotion. Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry or fearful, as the case may be." While agreeing with James that the bodily manifestations must first be interposed between the perception, or stimulus, and the final reaction or manifestation, at the same time it is difficult to accept this hypothesis that we feel sorry *because* we cry; angry *because* we strike; and afraid *because* we tremble. According to the thrill hypothesis we may say that we feel sorry *and* cry or we cry *and* feel sorry; are angry *and* strike or strike *and* are angry; are afraid *and* tremble or tremble *and* are afraid. It makes no difference as to which way we express the phenomena here, because neither the sorrow, anger or fear cause the crying, striking or trembling; nor does the crying, striking or trembling cause the sorrow, anger or fear, as the case may be. In no instance does the one factor cause the other; they are merely coincidently occurring manifestations and are both associated with a common cause, the thrill. As has been shown, the emotions are the sensory component of thrills, while the instincts are the motor component of them. The emotions are related to the varying degrees of stress caused in the organism when it initiates the thrill force, while the instincts are the expression of this thrill force in a motor way. In all events we have but one type of general organic activity occurring, regardless of the emotion or of the instinct manifested. Also, the instinct is not in any way directly related to the emotion. This last may be clearly illustrated in the following four examples: (1) If we have a thrill of a marked degree of intensity, readily produced in the organism without a stress, we will have a certain form of instinct manifested and a certain emotion, each depending upon their respective causative factors. (2) If the thrill is not of a marked degree of intensity but readily produced without stress, we will have a different instinct manifested,

while we may have the same emotion produced as in example one. (3) If the thrill is of a marked degree of intensity, but only produced as the result of much stress, we may have a similar instinct occurring here as in one, while we would have a different emotion manifested. (4) If the thrill was of a low degree of intensity and produced only by much stress, we would have an instinct and an emotion occurring that were different from any in the three previously mentioned examples. If the degree of stress produced in the organism is not too great we may find manifested merely a difference in degree of the same type of emotion: as from joy to elation to ecstasy; irritation to anger to rage; dread to anxiety to fear; or, surprise to astonishment to amazement. Here we have a variation of the same type of emotion, the difference being only one of degree of intensity. However, if the degree of stress is very marked, we will more likely have a complete change in the type of emotion to occur, as a change from love to anger; fear to grief; sorrow to love, etc. What has been said here in regard to the emotions may be applied likewise to the instincts, in regard to variations in the degree of intensity or volume of the thrill force, in its relation to motor and intellectual manifestations.

Passing now from the more elementary forms of mental activity to those higher forms which we recognize under the general term of "intellectual processes," we find that the change is not marked by any abrupt differences, but on the contrary is one that is gradual in its nature, that it is an evolutionary progression in mental development. In fact, we note these lower forms of mental activity being constantly present and forming the essential parts of all these higher forms of mental activity.

As a process which forms a connecting psychic link between those external factors, in the way of various stimuli, and the various internal factors, in the way of emotions and instincts, we have the process of "attention." It is to this process of attention that we must attribute the development of all the higher forms of intellectual activity as we know them. Hence it is necessary that we consider in detail the nature of this process and the various forms of manifestation which it exhibits.

In its most elementary form we may say that attention is merely the awareness of certain external or internal stimuli without any necessary cognition on the part of the organism as to its exact nature. Further, we may say that it is at first purely a passive factor, a process secondary to an exciting stimulus of some sort and of a reflex-action nature. Its asso-

ciation with a certain degree of motor response in the form of muscular tension has been noted by many investigators. As James says, "Movement is the natural immediate effect of feeling, irrespective of what the quality of the feeling may be. It is so in reflex action, it is so in emotion, it is so in voluntary life." Again, G. Stanley Hall remarks, "Truly spontaneous attention is conditioned by spontaneous muscle tension." Mosso states, "Attention produces not only the same chemical effects and the same fatigue as muscular exertion does, but we feel also, when we are attentive to anything, the characteristic muscular strain on the occiput, the forehead, and other parts of the body." He also mentions, "the intelligence, the sensitiveness, and the movement are phenomena which cannot be separated from each other, that their fusion and their connection belong to the same conditions which permit us to comprehend the nature of the mind." It is attention of this passive variety that Ribot has termed "spontaneous," James "passive," "reflex," "involuntary," or "effortless," Arnold "primitive," or "instinctive," etc. In order to obtain a clearer order of description of the several varieties of attention for the purpose of our discussion, we might term this first variety that we are considering, "passive objective attention;" "passive" here referring to the secondary nature that the individual has to the particular stimulus, and objective, to the external source of stimulus involved.

In this form or variety of attention we are considering it as being a reaction to some sort of intense stimulus—a bright color, loud sound, strong odor, or the awareness of an intense feeling of heat, cold, etc. It is the earliest variety of attention that an individual experiences and is in no way associated with any sense of interest but is merely felt as either a pleasureable or a painful experience. It in no way is associated with cognitive factors and is transitory or vague in this earliest form. In fact, it is only after repeated experiences of a particular stimulus that it finally becomes a definitely recognized factor. When this is beginning to take place, we may say that the individual is experiencing that second variety of attention which we will call "passive subjective attention" or attention in which the individual, while aware of the objective nature of the particular stimulus, has an internal or subjective sense of recognition. Again, although this variety of attention is associated with the development of a definite recognition of objective stimuli, this process of recognition is one that is very gradual in its nature. It is intimately associated with two other factors, that of memory, and, later, an association

of ideas. For this reason we will take up the discussion of this last-mentioned two before proceeding to discuss it further.

In discussing memory, Meumann writes, "Every mental process must have a certain minimal duration in consciousness if it is to establish a disposition to revival.' . . . "Every mental process must recur to consciousness a certain number of times if security of attention is to be retained." . . . "The rhythmic recurrence of impressions and ideas tends to reinforce their retention." Also, "Every experience which was attended by more or less intensive feeling or emotion . . ." becomes endowed with a greater tendency to revival.

We can see here that, in time, after an individual has acquired a store of experiences, he will gradually learn to discriminate between the various ones and that, likewise, those experiences which were unusually intense in their nature or those which were experienced more often than others will have a tendency to revival more readily. It is this acquired power of discrimination that makes possible what we term the "association of ideas."

We can readily note here that an individual's particular manner of association of ideas is directly related to his peculiar physical conditions and his environment. An individual whose general bodily tone is of high order would naturally associate a given experience in a different way from one whose general bodily tone is less pronouncedly strong. Again, social differences, age, sex, etc., may serve to account for a difference here. As Meumann says, "What particular idea shall appear in consciousness in any particular case is a matter which is not determined solely by the associative connections possessed by the ideas which are present at the moment; quite as much influence is exerted by the general condition of the individual, his freshness or fatigue, the fact that he is well-disposed or ill-disposed, the total group of impressions and ideas which are clearly or obscurely present to his consciousness, his feelings, and everything else that may be designated as his conscious constellation." These, as we shall now see, determine the choice of an individual's interests. As Arnold reminds us, "In the more advanced stages of development, interest and attention run together, but as first attention is somewhat in the lead. Conditions other than interest are able to impel attention. Thus, intensity of impression and feelings of pleasure-pain can excite primary or instinctive attention. Interest is not then in evidence. But if such instinctive attention results in pleasure, ease, satisfaction, and the like, it lays a basis of interest in such a situation.

"When the situation is again present there will be felt a

tendency to go through the process which resulted in the former feelings of pleasure or satisfaction. In more advanced stages, the interest and the attention are concomitant. Interest is then the impelling aspect, and attention the controlling."

It is to these passive objective, and, later, passive subjective varieties of attention, to the various experiences that an individual has felt as being either pleasureable or painful that we must look for the reasons of his individual interests, with their subsequent influence upon his later active forms or varieties of attention. It is to these that we must look for the understanding of why certain stimuli, both subjective and objective, cause an individual to express his thrills in a particular way; why a given stimulus causes an individual to have one type of thrill while the same stimulus has an altogether different effect upon another individual, and why two individuals express the same type of thrills in different modes of activity or behavior. The relation of interest to thrills here is: It is not so much a matter of stimulation, solely, but the combined effects of stimulation plus certain internal factors in the way of general bodily tone, physically, and the association of ideas, mentally, that determine the interest, attention, and the thrill. As James says, "The natural way of conceiving all this is under the symbolic form of a brain-cell played upon from two directions. Whilst the object excites it from without, the other brain-cells arouse it from within. The plenary energy of the brain-cell demands the co-operation of both factors; not when merely present, but when both present and inwardly imagined is the object fully attended to and perceived." Finally, in regard to passive subjective attention, we must bear in mind that it may be brought about by the spontaneous revival in the mind of certain memory images, without any direct relation to an objective stimulus. We note an example of this in what we call "day dreams" and in those fleeting thoughts that come to our mind from time to time.

When we come to consider the difference between the two passive varieties of attention, which we have been discussing, and those two active varieties, which we are about to discuss, we find that it is due largely to the added factor of interest in the latter. Whereas in the passive varieties an individual attends in more or less of a reflex way to certain stimuli, in the active varieties he purposely, or consciously, makes an effort to attend; that is, he is impelled by particular interests to attend. This variety of attention has been termed "voluntary," "secondary," "active," "sustained," etc. In the present paper we shall divide it into two varieties, which corre-

spond to the two general ways in which it is observed—"active objective" and "active subjective" attention. Since active objective is the first of the two varieties of attention to appear, we will discuss it first.

As Compayre remarks, "Charm, interest, is the great source of attention." It is this charm or interest that not only determines the particular choice of what we shall attend, but it likewise serves to sustain our attention after the choice has been made. Remove the interest and an individual ceases to be actively attentive. Ostermann says that it is the interest that causes the maintenance of voluntary attention and that all interests depend entirely on the feelings of like and dislike, of pleasure and displeasure. Arnold, expressing the same opinion but in other words, says, "Interest impels effort. In that an individual is before a situation which will, when properly controlled, lead to a state of pleasure, ease, and the like, effort will be put forth. There need be no immediate pleasure or satisfaction in such control so long as the final realization is more or less pleasureable and satisfying. If the terminus is more painful than the present situation, effort will likewise be shown, so long as such effort leads from the repelling situation. . . . Effort is nothing more than the subjective and felt aspect of motor control in the process of attention." Again Munsterberg remarks, "Effort is truly nothing but the working of auto-suggestion" and "The chief motive of human actions lies in feelings and emotions." In all the remarks cited we note that what impels an individual to actively attend to a given situation is the interest that this situation has for him; it is the interest that causes him to put forth the necessary effort required. It is not true that this interest is unvarying in its constancy toward a given stimulus. On the contrary, it varies with the individual's feelings, with his general bodily tone, and is seldom of the same degree of intensity for a given stimulus, tending to lose its force with the passing of time. It is not so much any single factor that maintains interest in a given situation as it is the presence of several factors which are associated; we can readily note this in the fatigue that readily ensues upon attention to monotonous excitation of any sort. We may attribute this last-mentioned fact to an exhaustion of certain groups of nerve-cells involved. So long as a different series of nerve-cells are aroused from time to time in relation to a given situation, so long as a given situation serves to stimulate in different ways, we may have present a sustained interest with its associated process of attention.

All that we have been discussing in relation to active ob-

jective attention have been instances where the individual was actively attending, because of some interest, some objective stimulus. In discussing this variety of attention we must bear in mind that it is supposed here to represent an activity that occurs only in response to an immediately present stimulus and is not related in any way to purely abstract concepts or subjective ideas in general.

We might, for example, say that it is the kind of attention that we will find present where one is interested in some game, such as golf, tennis, etc., which loses its intensity upon the cessation of the particular activity.

As the last and the highest form of attention we find developing in an individual, we have "active subjective" attention. In this variety we find an individual whose interest impels his attention not to external or objective stimuli but to inner, subjective ones. The form of stimuli here may be abstract conceptions in a way of solving mathematical problems, the composition of music or of poetry, etc., the invention of devices of various sorts, or the study of problems in science. Again, the various phenomena which we group generally under the title of "unconscious cerebration," those activities which go on in the lower levels of consciousness in the form of attitudes of behavior, personal convictions, etc., may be included here as being matters of active subjective attention of a less intense degree than those which have been previously mentioned.

It must be remembered here that while we have divided attention into four fairly distinct varieties this has been solely for the purposes of description. Just as was said when discussing thrills, that they are all forms of manifestation of a single phenomenon, the same may be said in regard to attention; it is of one character only but it manifests itself in various ways, as has been shown. Again, just as we noticed in regard to thrills that certain types of them are found associated with one condition of general bodily tone, while other types are always found associated with another condition—a lower degree of general bodily tone, for example—we likewise have a similar condition of affairs occurring in regard to the variety of attention that an individual manifests. We may say here, in a general way, that an individual is inclined to manifest a tendency towards a subjective form of attention in illness, in the form of introspection, for example; while in health he is inclined to manifest a tendency to the objective forms, less so to the subjective. As to which variety of attention he manifests most often, this depends partly upon his environmental demands and partly on his general bodily tone;

both of these must be taken into consideration from the standpoint of the particular individual since no two persons can be judged from a general standard. We may postulate it as a general law that as the general bodily tone becomes lessened, the interest becomes lessened in proportion. Hence, we find a certain parallel between certain degrees in the intensity of interest and certain types of thrills. For example, we find interest and attention most pronounced in positive active thrills and least pronounced in negative passive thrills, the other types of thrills showing intermediate degrees of attention and interest. This is because both interest and thrills depend upon the condition of the general bodily tone. We might say here that the interest directs the expression of the thrill when it passes from the physiological into the psychic realms; it determines what form of activity the thrill shall be expressed in, and since it varies from moment to moment with the general bodily tone, the expression of the thrill likewise varies. By the word "directs," I mean that it determines in a passive way, since interest is merely a term which may be said to indicate the viability of the nerve tracts involved in certain situations. If the passage of impulses is inhibited for any reason, whether this is due to fatigue, previous unpleasant experiences with a given stimulus, lack of intensity, etc., we shall have a lack of interest present. As Clàparede remarks in regard to interest, "Suitable choice ('choix adapte' i. e. a decision that harmonises with the wellbeing of the organism) is a process of the reflex-action type. It is not some mysterious power that chooses, but it is the want and the object combined which together effect the selection of the reaction most appropriate to the organism." In conclusion we may say that "the immediate effects of attention" (and interest) "are to make us: (a) perceive; (b) conceive; (c) distinguish; (d) remember; and that attention "shortens reaction-time." (James.)

After attention, habit! In fact, we may say that one may acquire habits of attention. However, in this case, as in all others, we may consider the habit as being the result; the attention, the cause. While at first, during the period when attention is most in evidence, the acquirement of the details of a mode of action are difficult, later these factors become easier of conception. As Dr. Carpenter says, "Our nervous system grows to the modes in which it has been exercised." In discussing the immediate effects of attention a moment ago, we noted that it shortened the reaction-time of an individual to a given stimulus. The relation that this shortened reaction-time has to habit-formation will be readily

perceived in what James has mentioned as being the effects of habit. He mentions that, "Habit simplifies the movements required to achieve a given result, makes them more accurate and diminishes fatigue" and that, "Habit diminishes the conscious attention with which our acts are performed." It is a question whether we should say here that "habit simplifies the movement, etc.," and "habit diminishes the conscious attention, etc.," unless we conceive habit to be the actions with which we are concerned here. If we consider the actions to be one thing and the habit another, it seems better to say that the habit is the result of these repeated activities and, therefore, that these last do these things which James mentions habit as doing. In this case we may more properly attribute the results as being due to repeated movements performed during an intense state of attention and say that it is the combined result of these two which accounts for these changes. We would then say that habit was the final result of this process; that these changes mark the presence of a formed habit, and not that habit itself is responsible for these changes in any way. In this way we may say that habit is not only an acquired phenomenon but that it is a passive or end product, the completed mode of action. As James remarks of the Duke of Wellington having said, "Habit is second nature! Habit is ten times second nature," we may, accordingly, say that habit is second nature, and that it is not a habit unless it is second nature. Therefore it does not do anything but merely marks the completion of something that has been done. If it seems that undue stress has been placed here in distinguishing the exact conception of habit as a passive rather than an active phenomenon, it is because it is necessary that we have a very clear idea of what habit is in order to properly understand its relation to thrills. Perhaps the most characteristic feature of thrills is the fact that they readily lead to a habit formation. For this reason it is advisable that we consider the formation of habits in a more exact way than we have in the foregoing.

In order to obtain an exact conception of what takes place in the formation of habits, it is necessary that we consider what are the organic activities that occur during the process of their formation.

As Munsterberg says, "What else can be the brain's function in the midst of nature than the transforming of impressions into expressions, stimuli into actions? It is the great apparatus by which the organism steadily adjusts itself to the surroundings. There would be no use whatever biologically in a brain which had connections with the sense organs, but which had no connections with the muscular system; and on

the other hand, a brain which had motor nerves and muscular adjustment would be entirely useless if it had not sensory nerves and sense organs connected with it. In the one case the world would be experienced but no response would be possible; in the other case, the means of response would be given but no adjustment could set in because no experience of the surroundings would be possible. Adjustment every moment demands the relation of the brain in both directions. Through the sensory nerves the brain receives; through the motor nerves the brain directs, and this whole arc from the sense organs through the sensory nerves, through the brain, through the motor nerves and finally to the muscles, is one unified apparatus of which no part can be thought away. The brain in itself would be just as useless for the organism as the heart would be without the arteries and veins. We must keep this intimate and necessary relation between the sensory and motor parts constantly in view, and must understand that there cannot be any sensory process which does not go over into motor response."

Again, as James remarks, "The currents, once in, must find a way out. In getting out they leave their traces in the paths which they take. The only thing they can do, in short, is to deepen old paths or to make new ones; and the whole plasticity of the brain sums itself up in two words when we call it an organ in which currents pouring in from the sense-organs make with extreme facility paths which do not easily disappear." In the foregoing we note that there is always involved, in every mental activity, both a sensory and a motor part. The question that naturally arises here is: what happens when we receive a given stimulus and do not act? In answering this we might say that the lack of response is due to the fact that the stimulus was too feeble to arouse our attention. Again, we might say that the lack of response is due to an act of deliberation on our part; that instead of the sensory impulse received passing over into a concrete act, it was dissipated or utilized in arousing other brain-cells in the way of establishing an extended association of ideas, and that part of the impulse was used to inhibit muscular activity; this last being manifested in a tension of the muscles affected. However well such an answer may serve to explain the question, it lacks much in the way of being exact. So, in order to obtain a more exact conception of what is involved here, let us consider the problem from the standpoint of recent discoveries that have been made in regard to habit formation and its allied factors.

We noted, when quoting Munsterberg and James, that

every nervous activity, whether it be a simple physical reflex action or a conscious mental process, involved the use of both sensory and motor nerves. We speak of this intimately associated relationship of these nerves as a "sensori-motor arc," and in addition we have learned that all impulses pass through this arc but in one direction, from the sensory to the motor nerve. This has been termed the "law of forward motion." In the simple reflex actions, where the process is not under conscious control, we can note the presence of these sensori-motor arc very readily. Given a sensory stimulus, we observe an immediate motor response. However, when we come to the consideration of what we term "consciously willed acts," we note that the immediacy of response between a sensory stimulus and a motor reaction is oftentimes delayed or lacking. Therefore, we know that there must be a process of some sort that serves to block, to control, the passage of impulses from a sensory nerve to a motor nerve and that this process comes into action in varying degrees from time to time. As Eliott Park Frost remarks, "now this exquisite function apears to be performed in human nervous systems by a microscopic mechanism found in every sensori-motor arc. Its discovery has been only recent. The name given it is "synapse."

Further, "It has been proved that in the nerve proper an impulse can pass in either direction, while on the contrary just as soon as a synapse is crossed the nervous process becomes irreversible. Synapses act like trap-doors, allowing nerve currents to pass in one direction only. Still again, experiment has established the fact that these "trap-doors" will not open when a weak impulse presents itself, but will dam back the energy in such an impulse, resisting it until several such feeble currents have been summed together. This resistance is then broken down by the collective energies, thereby accomplishing what one or two impulses alone could not do; that is, move the muscle" This last is what James has termed the "law of the summation of stimuli." We now see why a given sensory stimulus may, within limits, not pass over into an immediate motor response. As Ribot remarks, "We can classify ideals roughly into three groups, according as their tendency to transform themselves into action is strong, moderate, or weak and even, in a certain sense, null.

1) The first group includes extremely intense intellectual states, of which fixed ideas may serve as a type. They pass into action with a fatality and rapidity almost equal to those of reflexes. These are the ideas which "take hold of us."

2) The second group is the most important for us. It rep-

resents the rational activity, the will in the usual sense of the word. The conception is followed by an act after a short or long deliberation.

3) In abstract ideas, the tendency to movement is at its minimum. Their motor tendency is reduced to that interior utterance, slight as it may be, which accompanies them, or to the awakening of some other state of consciousness. For just as in physiology the centrifugal period of a reflex does not always end in a movement but as likely in the secretion of a gland or a trophic action; in the same way, in psychology, a state of consciousness ends not always in a movement but in the resurrection of other states of consciousness according to the well-known mechanism of association."

In regard to habit formation and habit reformation this phenomenon of synaptic action has a twofold importance. In order to establish the formation of a habit it is necessary that the sensory impulse be reacted in a motor way before we can have any effects produced. As James says, "It is not in the moment of their forming, but in the moment of their producing motor effects, that resolves and aspirations communicate the new 'set' to the brain." Also that we must take care to "launch ourselves with as strong and decided an initiative as possible;" the importance of this being due to overcoming the resistance of the synapses, which we have previously mentioned.

Finally, in overcoming the bad habits we must bear in mind the fact that once a habit is formed, a given stimulus tends to go over immediately into a motor reaction. As Elliott Park Frost remarks, "We know that consciousness is motor, that the things of which we think are bound to get into action unless prevented by some other action. . . . All acts are the direct result of ideas that, for the moment at least, are free and unchecked by contrary ideas." Just what decides what set of ideas shall go over into motor activities under given circumstances is a matter of great importance for us to know, and since this is commonly attributed to what we speak of as the "will," we will discuss it next.

As Ribot has remarked, "Man is led by his feelings alone," and, "It is in the natural tendency of feelings and images to express themselves in movements that the secret of acts should be sought." Spencer, expressing his opinions of what constitutes the "will," says, "We speak of Will as something apart from the feeling or feelings which, for a moment, prevails over others; whereas it is nothing but the general name given to the special feeling that gains supremacy and determines action. Take away all sensations and emotions, and

there remains no Will. Excite some of these, and Will, becoming possible, becomes actual only when one of them, or a group of them, gains predominance. Until there is a motive (mark the word) there is no Will. That is to say, Will is no more an existence separate from the predominant feeling, than a King is an existence separate from the man occupying the throne." As James remarks, "The self-same person, according to the line of thought he may be in, or to his emotional mood, will apperceive the same impression quite differently on different occasions;" also, "Every one knows only too well how the mind flinches from looking at considerations hostile to the reigning mood of feeling." "Will is not an absolute power, an authority scorning help of any sort," says Compayre. "To state it exactly, it reigns but does not govern. What does govern is the ideas, the feelings."

Having seen that the will is nothing more than the supremacy of one state of feeling over that of another in producing certain motor effects, we will now proceed to obtain a more exact nature of this process. As Munsterberg says, "Perhaps we shall most quickly bring the most essential facts together, if we say that full vividness belongs only to those sensations for which the channels of motor discharge are open, while those are inhibited for which the channels of discharge are closed, and any channel of discharge is closed if action is proceeding in the opposite channel. If I open my hand, the motor paths which lead to closing my fist are blocked; and if I close my fist, the channels which lead to the opening of the hand are closed. Now if only those ideas are vivid which find the channels open, it is clear that all the ideas which would lead to the opposite action have no chance for development; they remain inhibited." This description accords with Nicholl's description of interest; interest, as we know, being a component part of all acts of will. Nicholl says, "We may criticize a man on two counts. One is for some kind of excess; a too great vanity, or talkativeness, or avariciousness, or sensuality, or diligence, or piety. The other is for some deficiency; he is stupid, or mean, or narrow, or shy, or lazy. If these qualities be turned into terms of interest, we can say that in a general sense we criticize a man either for an over-expression of interest in some form, or for an under-expression." Again, if these same qualities be turned into terms of will, we can say that the former manifests an excess of will, and the latter a deficiency. Munsterberg's description serves, in a general way, to likewise account for the phenomena of obstructed and of explosive types of will. The obstructed type of will is attributed by James to be due to either an

excess of inhibition or to a deficiency of impulsion, while the explosive type is due to either an excess of impulsion or a deficiency of inhibition. However, James fails to explain which of the two factors are most likely to be involved in either of these two types of will; nor does he offer any means of differentiating between whether, in a given instance, we may say that it is an excess of inhibition or a deficiency of impulsion, an excess of impulsion or a deficiency of inhibition, that is at fault. It would seem that such a distinction is of great importance to us in a psychological way. We can hardly fail to appreciate that, under given circumstances, a condition due to an excess of inhibition would not have exactly the causes involved as would a condition due to a deficiency of impulsion, nor would a condition due to an excess of impulsion have the same causes involved as one in which there was a deficiency of inhibition.

In order to acquire a clear definition of what is involved in each circumstance, whether it be an excess of inhibition or a deficiency of impulsion, an excess of impulsion or a deficiency of inhibition, we must bear in mind the following three factors: (1) that when one motor tract is open, its opposite tract is closed. (2) that all impulses are subject to the laws of synaptic conduction. (3) that the lowered tone of nerve cells may be localized to certain portions of the brain or it may be a general physical condition.

It is a generally recognized fact that the first symptom of a fatigue of the nervous system is a tendency towards impulsive action. This tendency has been described as an "irritable weakness," and manifests itself in a quickness of response to stimuli. Again, if this process of fatigue develops in a more pronounced degree, we note a lessening of this rapidity with which an individual responds to stimuli, and, in its stead we notice a successive decrease in the degree of response as the fatigue increases. The former is due to a hypersensitiveness of the nerve-cells; the latter, to a decrease in the sensitiveness of the nerve-cells.

In those instances where we have an insufficient inhibition we may attribute it as being a symptom of irritable weakness of the nervous system, either local or general in its nature. As Ribot remarks, "The impulse may be sudden, unconscious, followed by an immediate execution, without the understanding having even had time to take cognizance of it. . . . The act has then all the characteristics of a purely reflex phenomenon which takes place inevitably, without any connivance of the will. It is a true convulsion which differs from the ordinary convulsion only because it consists of movements

associated and combined in view of a determined result." It may manifest itself in acts of sudden anger, depression, etc. Again, as Ribot mentions, "Among epileptics, impulses of this kind are so frequent that pages might be filled with them. Hysterical patients would also furnish innumerable examples; they have a frantic tendency to the immediate satisfaction of their caprices or of their wants." Whether we observe insufficient inhibition in normal individuals of neurotic tendency or in the more aggravated forms of neurotic disorders we must look upon it as being a symptom of fatigue of the nerve-cells in its milder degrees. When the fatigue increases, this insufficient inhibition is no longer evident; we then have either a condition of complete inhibition or of insufficient impulsion existing. We shall discuss these presently.

Passing now to the study of conditions where there exists an excess of impulsion, we find that the causative factors are very different from those which we find associated with insufficient inhibition. Whereas in insufficient inhibition we find that "the acts are unconscious (at any rate not deliberate), immediate, irresistible, with an adaptation invariable and of little complexity," in conditions of excessive impulsion "the patient has full consciousness of the situation; he feels that he is no more master of himself, that he is dominated by an interior force, irresistibly impelled to commit acts that he reprobates. The intellect remains sufficiently healthy, the madness exists only in acts." As Ribot further remarks, "The most simple form is that of fixed ideas with obsession;" that "every fixed idea is at the bottom a sentiment or a fixed passion. Some desire, love, hatred, or interest supports the idea, and imparts to it its intensity, stability, tenacity. Ideas, whatever we may plead to the contrary, are always at the behest of the passions; but they resemble masters who obey in imagining they rule." The types of excessive impulsion may be intellectual in their origin; that is, arising in intellectual states, pure ideas (not wants or feelings), or they may be of affective origin arising from needs and instincts. Arithmomania, onomatomania, dipsomania, kleptomania, pyromania, etc., are some of the forms of manifestation of excessive impulsion. "It is sufficient to note," says Ribot, "that all these creatures of impulse have the same characteristics; they are conscious, incoordinated, incapable of struggle."

In some respects, fixed ideas bear a resemblance to what we ordinarily speak of as "habits." In fact we may say that fixed ideas are certain forms of habits, of an unusually intense nature. We are all acquainted with instances in which a certain tune of music continues recurring in our mind or the

thought of a certain person continues to haunt our mind; these are but milder forms, differing from the types of fixed ideas which have been mentioned in being of relatively brief duration. Recent researches in psychological phenomena have established the fact that habits, fixed ideas, and similar actions are the effects of a single type of cause and differ only in degree. The cause of these similar modes of reaction is what has been termed a "complex."

Dr. Bernard Hart has described "complexes" so clearly that I shall quote his description of them at length. He says, "The ascertaining of the causes determining the flow of our consciousness is the ultimate aim of psychology. We shall expect, of course, that the laws discovered will be identical in the sane and insane; just as the physiological laws determining the processes of the diseased body are the same as those determining the processes of the healthy body—the difference is merely one of degree and combination in the causes concerned.

Now we may get an idea of the direction in which we would search for these determinative causes by the consideration of some simple examples. Let us suppose that I am an enthusiastic photographer. It is obvious that the existence of this hobby will continually affect the flow of my consciousness.

Scenes which would otherwise be indifferent to me will frequently arouse interest as possible material for a picture; if I peruse a newspaper an article upon photography will at once arrest my attention, and when I meet my friends, I shall seize every opportunity to turn the conversation to my favorite pursuit. We see, in fact, that the hobby is one of the causes determining the direction of my thinking. Now, if we endeavor to ascertain the exact nature of a hobby, we find that it is a system of connected ideas, with a strong emotional tone, and a tendency to produce actions of a certain definite character. Such a system of emotionally toned ideas is termed in technical language a "complex" and a hobby is to be regarded as a particular variety of complex. In the simple case just described we should say that one of the causes determining the flow of my consciousness was a strong "photography complex."

Complexes may be of all sorts and kinds, the component ideas may be of every variety, the accompanying emotional tones pleasant or painful, very intense or comparatively weak.

When the emotional tone of a complex is very intense, the action which it exerts upon consciousness becomes correspondingly great. . . . Complexes, then, are causes which determine the behavior of the conscious stream, and the action

which they exert upon consciousness may be regarded as the psychological analogue of the conception of "force" in physics. They are not, of course, constantly active, but only become so under certain conditions. These conditions consist in the presence of a "stimulus," occurring whenever one or more of the ideas belonging to a complex is aroused to activity, either by some external event, or by processes of association occurring within the mind itself." While the subjective awareness of the existence and action of a complex may be present, Dr. Hart reminds us that, "A complex may exert a pronounced effect upon consciousness, although the individual himself may be unaware of its action; that is to say, he may be altogether ignorant of the causes which are really determining his own mental processes."

We see from the foregoing description of complexes by Dr. Bernard Hart that all psychic states, either intellectual or affective, are aroused by feelings of pleasure or of pain. Also, that what we ordinarily speak of as "habits," as well as those morbid conditions which we term "fixed ideas," are the result of a common factor, the complex, which is aroused under varying degrees of intensity and duration. We shall have occasion to discuss complexes again, when considering consciousness as a general process.

Returning now to our discussion of states of the will, we have that condition which we speak of as "insufficient impulsion" to consider next.

The condition which we are describing as being "insufficient impulsion" is technically termed "abulia." In what further discussion we shall make of this condition we will use this last-mentioned term.

Just as we saw, when discussing excess of impulsion, that the condition may vary from a transitory state in individuals who are ordinarily of healthy constitution and mind to those conditions which are chronic and of marked development, so we may witness this to be equally evident in regard to abulia. As Ribot remarks, "Each one of us can, moreover, picture to himself this state of abulia; for there is no one who has not been through hours of dejection in which all excitements, exterior and interior, sensations and ideas, remain inoperant, leave us cold. It is a touch of abulia. There is only the difference between a less and a greater, between a transient condition and a chronic state."

In describing individuals affected with abulia, Ribot quotes Guislain as saying, "The patients know how to will interiorly, mentally, according to the dictates of reason. They may experience the desire to do something, but they are powerless to

act accordingly. There is at the bottom of their understanding an incapacity. They would wish to work and they cannot. . . . Their will cannot go beyond certain limits; one would say that this power of action undergoes an inhibition; the 'I will' does not transform itself into impelling volition, into active determination. Some patients are themselves astonished at the impotence with which their will is stricken. When they are left to themselves they pass entire days in their bed or on a chair. When any one addresses and arouses them they express themselves suitably, although in a short manner; and they judge of things fairly well." One notices here that we are considering individuals whose general bodily tone is low. What Guislain describes as being "the desire to do something" may be considered to be analogous with what has been described in a previous portion of this paper as a "thrill craving." "The muscular system and the organs of movement are intact. From this side there is no impediment. The automatic activity, that which constitutes the ordinary routine of life, persists." "The intelligence is perfect; at least nothing authorizes one to say that it has suffered the least impairment. The end is clearly perceived, the means likewise, but the transition to act is impossible." Although this condition of the will is one that is relatively the same from day to day, Ribot reminds us that, "On the contrary, when an excitation is very violent, sudden and unexpected, that is to say, unites all the conditions of intensity, it most frequently acts." Again, we might say here that it is only when the individual is "thrilled," using this term in the sense in which I defined it in a previous part of the present paper, that he reacts and that ordinary stimuli are insufficient to produce this thrill. In fact, we find in insufficiency of impulsion that the conditions existing are the same as those which were described when discussing negative passive thrills. To quote from Ribot once more in regard to this condition, he says, "If these patients cannot will, it is because all the projects which they conceive awaken in them but feeble desires, insufficient to impel them to action. I express myself thus in order to conform to the current phraseology; for it is not the weakness of the desires, considered as simple psychic states, which induces the inaction. That would be to reason from appearances only. As we have shown above, every state of the nervous system, corresponding to a sensation or an idea, expresses itself so much the better in movement as it is accompanied by those other neural states, whatever they may be, which corresponds to feelings. It is from the weakness of these states that abulia results, not from the weakness of the desires, which is only a sign.

The cause is then a relative insensibility, a general impairment of sensibility; what is attacked is the emotional life, the possibility of being moved. Whence does this morbid state itself come? The problem is chiefly of a physiological order. Beyond doubt there is in patients of this class a notable depression of the vital activities. It may reach such a point that all the faculties are affected and the individual becomes an inert being. This is the state that the physicians designate by the names of melancholia, lypemania, and stupor, whose physical symptoms are a slackening of the circulation, a lowering of the temperature of the body, and an almost complete immobility. These extreme cases go beyond our subject; but they reveal to us the ultimate causes of the impotences of the will. Every depression in the vital tone, slight or profound, fugitive or lasting, has its effect. The will so little resembles a faculty reigning as a mistress that it depends at each instant upon the most trivial and hidden causes; it is at their mercy."

In those conditions of impairment of the will which we will now consider under the descriptive title of "excess of inhibition," we are dealing with conditions "which arise from a sentiment of fear, without a reasonable motive, which varies from a simple anxiety to anguish and stupefying terror. The intellect apears intact in certain cases, impaired in others." They differ from the type of will which we last discussed in the way "that the incitation to act is not extinct. . . . The inhibition results from an antagonism." Ribot, in describing this condition of impairment of will, cites "agoraphobia" as an example and describes it as being "a fantastic anxiety which paralyses the will, and against which the individual is powerless to react, or succeeds in doing so only by indirect means." As Hollander remarks, "There are a large number of other forms, such as fear of lightning, fear of precipices, fear of blood, etc. Others manifest a dread of cancer, or other special disease. . . . The patient recognises the absurdity of his dreads, and in a feeble way strives against them; but the lassitude of will is too great to be overcome, and he returns to his fears and anxieties." Like the conditions of mania which we noted when discussing "excessive impulsion," these various forms of phobia which we observe here, are conditions where the disorder is one that is primarily in the psychic realms; that is, it is due to a lowered tone of certain groups of brain-cells, to a disorder that is more or less localized in the brain, and one where the condition of the general system may be fairly normal in tone.

Finally we may observe conditions where there is an extinction of the will, conditions in which there is neither choice nor action. As Ribot remarks, "When all the psychic ac-

tivity is or seems to be completely suspended, as in deep sleep, artificial anaesthesia, coma, and analogous states, it is a return to the vegetative life; we have nothing to say of this; the will disappears, because everything disappears. Here we have to do with cases where a form of mental activity persists, although there is no possibility of choice followed by action. This annihilation of the will is met with in ecstasy and in somnambulism." Describing ecstasy, he says, "When this state is attained, the ecstatic presents certain physical characteristics; sometimes motionless and mute, sometimes expressing the vision that possesses him by words, songs and attitudes. He rarely moves from his position. His physiognomy is expressive; but his eyes, even though open, do not see. Sounds no longer affect him, save, in some cases, the voice of a particular person. General sensibility is extinct; neither pricking nor burning cause pain. . . . We have here a curious case of psychological correlation or antagonism; all that one functions gains is lost by another; all that is gained by thought is lost by movement. In this respect, ecstasy is the opposite of the states in which motility triumphs, such as epilepsy, chorea and convulsions. Here we see a maximum of movement with a minimum of consciousness; there, intensity of consciousness, with minimum of movement. There is at any moment only a certain nervous and psychic capital disponible; if it be absorbed by one function, it is to the detriment of the others. Its employment in one direction or the other depends on the nature of the individual." In regard to this last statement of Ribot's, it seems more justifiable to say that this use of nervous force in either one way or the other is not so much a matter of the quantity of this force but that it is a phenomenon which accords with the laws of nervous functions, as Munsterberg has postulated them; that when certain nerve-tracts are open and discharging nervous force, those tracts which would permit the display of opposite actions, are closed. We are to suppose here that not only is this opposition of action a factor which is observed in certain physical motor activities but that there exists an opposition between purely intellectual activities and those of a purely physical kind. Further, we have already noticed that a given stimulus may serve to produce an immediate motor response, or it may receive a response of a non-motor character; that is, it may bring about an extended process of an association of ideas; the force may be used "in an intellectual way."

Whether we are considering one of these forms of will manifestation or another; whether it be, on the one hand, those extremes of activity which we note in excessive impulsion; the almost complete absence of activity, which we note

in extinction of the will, or any of the intermediate forms that have been described, in all instances we are merely observing particular forms of manifestation of a single phenomenon acting under different internal or external circumstances. In some instances we note a predominating physical weakness, a general lowered bodily tone, as being a fault. This was especially noticeable in those forms which we considered as "insufficient inhibition" and "insufficient impulsion." In other instances we noted that the fault was more localized; that it was not so much due to a general lowered bodily tone but was primarily a disturbance in the cerebrum, a lowered tone occurring in certain groups of brain-cells. This condition was found to be present in what we described as "excessive inhibition" and "excessive impulsion." Again, in all instances, we note that the will is guided and affected by feelings of pleasure and of pain. Finally, we may note that certain forms of will manifestation, which we have been considering, show, in a general way, a tendency to exhibit the predominance of certain types of thrills: the forms of wills described as "insufficient inhibition" and "excessive impulsion" showing negative active thrills, and the forms of will described as "insufficient impulsion" and "excessive inhibition" showing negative passive thrills.

In considering the various factors of which all psychic activities are constituted, it has been very difficult at times to make a separate description of each factor, since all are so intimately related. This was especially true when we attempted to subdivide each phenomenon described. Not only did we note that each factor was intimately related to every other motor factor, and dependent upon it for its presence, but we likewise noted that all the phenomena, in turn, were directed by the feelings of pleasure and of pain; that is, these two factors determine what form of activity is needed from moment to moment in order that the individual be in relation to his environment. However seemingly absurd some of the factors, which we have been considering, may appear as attempts at this adjustment, we must nevertheless bear in mind that in all instances, without exception, an individual acts in that way which it feels, either consciously or unconsciously, is best under given circumstances. Sometimes it is the relief of pain; at other times it is the seeking of pleasure that appears most prominent in an individual's particular conduct of the moment. In either event we must consider that it is the pursuit of happiness, the seeking to attain a sense of "physiological well-being," that is the guiding ideal. Whether we are considering this factor of the "ideal of physiological well-being," in terms of attention, interest, habit, will, emo-

tion or instinct, all of these phenomena are but factors whose activity is motivated towards the attaining of happiness and the freedom from pain; and since it is the combined effects of all phenomena which we have been considering that go to make up "consciousness" in all the varying degrees of its existence, we may in truth say that the ideal of well-being is the ultimate aim of our existence and that thrill-cravings and expressed thrills are the means whereby this ideal state of being is most effectively and immediately attained. We may then say that the emotions, instincts, attention, interest, will, and the other factors are but means whereby thrills are sought and are experienced; and which, in being experienced, afford to us a temporary relief from the feelings of stress that are brought about by the repression that civilization has placed upon our more primitive desires and actions.

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PSYCHOLOGY AND INDUSTRY[1]

By G. Stanley Hall

When your distinguished President honored me, a psychologist, with an invitation to speak here today to you engineers, he will bear me witness that I was surprised, and hesitated. And well I might, for one does not often hear of a student of human nature saying anything to which students of physical nature care to listen. But in fact, however, there is or ought to be today a new and most significant *rapport* between us, and therefore I could not, despite many limitations, quite justify myself in refusing this invitation which seemed to me something of a challenge. And so I invite you to consider with me a few of the human factors in our modern industrial life.

At the outset let us remember that modern man, *homo sapiens,* or human nature as it exists today, is, at the very least, one hundred thousand years old (some think far older), while the revolution that introduced modern industrialism is less than two hundred years old. On this basis man is five hundred times as old as his industrial system (Ordway Tead). From this it follows that the basal laws of human nature are somewhat like those of physical nature, relatively fixed and constant, and that they must be studied and adjusted to, for they are hard to change compared with our very recent industrial, to say nothing here of our social and political institutions.

All great movements of history and pre-history have been products of unrest and of man's struggle to make or find an environment that better suits his nature and his needs. It took the world a long time to learn that religion was made for man, and not man for religion. More recently we have been learning that the school was made for the child, and not the child for the school. Today we are in the midst of the same Copernican revolution in industry and are beginning to realize that it was made for the better development of man, and not conversely. It, too, can never be stable until it fits human nature and needs.

But let me say at the outset that the nascent but inevitable

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advent of democracy into industry is not to be attained by any bolshevik program of confiscation or nationalization of capital; nor by any form of government socialism, or by the French or any form of syndicalism; nor by any modernization of the medieval guilds; nor by any development yet in sight of the efficiency system, which has so far contributed almost as much to the discontent of Labor as it has to the effectiveness of organization; nor even by the full program of the Whitley reports. Permanent and settled industrial peace and good-will can only be found in a full and unreserved coöperation between Capital and Labor, with some complete scheme of joint control and profit-sharing, involving more knowledge by the laborer of the business as a whole and more loyalty to it. This alone can bring harmony, avoid the excessive waste of friction, ill-will, sojering on the job, labor turn-overs, strikes—of which an official report a few months ago told us there were 365, or one for every day of the year, on at that time in this country—and all the other wastage of energy from unemployment to sabotage. All these disorders which are so ominous for the business and economic future of this country and its supremacy in the markets of the world are, in a sense, of psychic origin, and the cure must be sought by a better knowledge and a wiser regimentation of the mind of labor.

Can we ever hope to accomplish the colossal engineering with the forces of Mansoul which will bring accord where there is now a discord utterly without precedent? I think we see the direction and some of the first steps toward this goal.

But before designating these, let me first remind you that psychology has, almost within a decade, made a great discovery which is very much in point here, viz., that of the unconscious side of man's nature. The field of consciousness, which used to be our muse, is far too narrow, so that man very rarely knows what he really wants or what are the causes of his troubles. Consciousness is like the one-ninth of an iceberg that is above the water, once thought to be guided by the winds while in fact the impelling force is the currents of the denser medium in which the other eight-ninths are submerged. How often we think we are doing this or that by this or that means, when we realize later in fact, as history does for mankind, that very different goals were really sought for! Thus the mind as we knew it before is like a port of entry and departure for a vast hinterland, or like a clearing-house. Thus with all social and political movements, as well as with industry, we have to look under the threshold of the mind for real causes. In this era of the unconscious we are now doing that as never before in every field of thought. It is a little

as if the individual and the race had found a new and larger soul, so that the past, present, and future require reinterpretation.

In view of this let us enumerate a few of the deeper primal needs of man on which his tranquillity and effectiveness depend, quite as often and perhaps more unconsciously than consciously, and failure to satisfy which makes for unrest and sometimes for revolution.

(1) The first of these is the homely need of sufficient and fit food and drink. Nutrition is the basis of life. The first use of every sense, all of which are located near the entrance of the alimentary canal, was as a food-finder or tester. A large part of the intelligence of animals which we marvel at as instinct is directly developed by and from the food quest. The voluminous studies of the Pavlov school show us that anything that comes to be associated with food for the animal or for the human infant becomes an organ of apperception. All migrations of animals and also of men have always been from areas of scarcity to those of more adequate food supply. Many studies show, too, the effects of sub- or mal-nutrition in children. The under-nourished are far more fatigable; they have less power to resist infectious diseases and to recover from wounds, injuries, or illness; they are more likely to be arrested before the later, higher stages of physical and mental maturity are attained; and they are far more nervous and irritable. There is a marked correlation in children between subnutrition and runaways, truancy, and theft, which often begins in the theft of edibles. Very slight nutritive defects are often summated for months and years, as, e.g., a slight insufficiency of salt, long continued, causes flocks of animals and tribes of men to trek till this nutritive deficit is compensated for. Who can doubt that the general recent food shortage, especially in Central Europe, has much to do with the general unrest there, or that taking away the tipple to which the workman was long used is another contributing if unconscious factor in every kind of discontent, for the new nutritive balance that prohibition requires always causes men to make more demands upon the home table or dinner pail and thus brings added responsibilities to the housewife. The working man is, in some respects, peculiarly dependent upon his dietary, and the lank and hungry are predisposed to listen to radicals.

The many researches in this field show that it is the early stages of a long fast that cause most disquiet, and also that a stated reduction of food to a half or quarter of the normal, while it sustains life indefinitely, is vastly more disquieting

and painful than is complete abstinence. When from food insufficiency the body begins to draw on its own reserves and consume itself, taxing as it does the various organs and functions in a rather definite scale, some of them losing a tenfold larger percentage than others, not only efficiency but character undergo certain degenerative changes, and there is a diffused anxiety which suggestion may cause to focus on almost any object in the environment. Thus the underfed man not only can do less work and does it with more friction, like an engine only partially fueled and oiled, but he becomes more or less combustible at the touch of any kind of agitator. The dread of insufficient food in the near future is another grain of sand in the machine. Thus, in fine, we are realizing as never before what a dangerous factor in politics, society, or industry, protracted and prolonged sub-or mal-nutrition may come to be. Napoleon said that the best reinforcer of courage in the soldier was to be able to "fight on a full belly," and the morale of labor of every kind rests no less squarely upon the basis of metabolism. So our great industrial army, which works on its belly, needs a new Hooverism, which science and many social agencies are now, at least in part, prepared to supply.

If the daily ration of food or nutritive values throughout this country were cut to one-half or one-third, as for the bourgeoisie in bolshevik Russia, or even to one-fourth of the normal need, we should live on indefinitely and even "carry on" after a fashion; but efficiency would gradually sink in nearly the same proportion; our national disposition, buoyant and optimistic, would sag; accidents would multiply; our mores and morale would decline; and the growing dis-ease would start or augment every tendency in the direction of revolution and even anarchy. Miss Gamble tells young women the best way to manage a husband is to keep him well-fed and never allow him to get thirsty. No matter what policies or treaties nations adopt, the world can never hope for assured and lasting peace as long as its food supply is insufficient and insecure.

(2) The second basal need of man is wife and children. This is the racial as hunger is the individual factor in the mental hygiene of industry. It roots in and irradiates from the sex urge, from which evolve all the secondary sex qualities of mind and body which make the family and the home, and which is sublimated in the higher forms of culture, social life, and religion. Statistics show that married men are more conservative, less prone to rove, have more incentive to earn, save, and look ahead. But they need a larger wage, and if their loved ones suffer privations, their exasperation at hard conditions is more intense and perhaps desperate. These nor-

mal domestic and family instincts, if thwarted or repressed, sooner or later find vent in subtle mental distempers which psychiatry is just beginning to understand, or else in social and industrial revolt, the real cause of which is also deeper and other than we have hitherto realized. Studies of the I. W. W. show how many of its members have never known or have thrown off all family ties, and one writer estimates that in the last ten years there have been fifty thousand clinical cases which show lives wrecked or gravely jeopardized by perversions of the *vita sexualis* in the new and larger light in which this is now interpreted. The workman loves his wife, children, and home as much as, and some would have us believe more than, the millionaire. He feels every pang and slight as acutely, he is no less solicitous for their present well-being and future career, and is probably more ready to make sacrifices for them. The wifeless, childless, homeless man is not only a greater industrial risk but is prone to turn to vicious vicariates for these domestic instincts, for without these hostages to fortune he is prone to focus on self the affections meant for posterity and the perpetuity and improvement of the race. It is not so much the pithy hints on sex hygiene, which did so much good in the army, that the workman needs, although this does good; he needs more a few of the basal principles of eugenics, which Galton thought the religion of the future, but most of all he needs incentive and opportunity to take a mate and start a family near the dawn of the now rather well-defined age biologically best for nubility and procreation and not after its heyday has begun to fade and he has learned to satisfy these racial needs by inferior surrogates. Perhaps in no domain of our modern life is there so much new knowledge so unapplied today, but from which we may hope for so much in the near future.

(3) A third basal instinct never so strong as since evolution became the watchword of culture and in a true democracy in which the way to the highest is open to the lowest, is the impulse to get ahead, to progress, to improve, to make the most and best out of this present life. The motto of even the ever fewer who have some vestige of belief in a future life of compensations is "One life at a time, and this one now." This urge is seen in the millions of young and middle-aged men taking extension, continuation, and correspondence courses, either to make up for neglected opportunities in the past or to keep abreast with the very latest advances of knowledge and skill. Nowhere does the fate of that vast multitude of unskilled toilers in the world, who, as statistics show, at twenty have reached their maximum of industrial efficiency

and see nothing ahead but decades of the same drudgery, seem so intolerable. Nowhere are parents so anxious that their children should rise above their own estate, and nowhere does the merely living wage seem so exasperating. This country was peopled from the first to now by those in the world who were restless at home and sought and expected more freedom and more possessions or both, and this American-itis, as we call its extreme form, colors our every industrial and social problem. In so far as we have escaped the old-world stratification of ranks and classes, we have bought this immunity at the high cost of having a horror of inferiority and stationariness unprecedented in history, to say nothing of the all-dominance of mediocrity. The reorganization of labor must reckon with this tendency and realize that the standard of living of the workman must be indefinitely improved so that he may be able to lay by for the future rather than be dependent upon old-age pensions and accident- and health-insurance, which are too paternal for the American spirit. This spirit, I fear we must realize, nothing will ultimately satisfy short of profit-sharing, although we admit that this involves practically joint ownership with capital. To this, I fear, too, we can see no alternative except the desperate and unpractical one of either sovietism or the free importation of Mongol or other cheap labor, unless, indeed, some of our interests have to go where labor is instead of bringing it to us. The instinct of ownership, which has made some ten thousand millionaires in this country, is strong in every American, who perhaps on the whole prefers wealth to anything else in the world. To hold property, even a little, not only makes for conservatism but extends the limits of personality, making the holder alive to everything in the environment which affects his interests. It is thus one of the most educative and man-making of all the agencies in the modern world, and if it represents real service in the community, it is, on the whole, the very best measure of worthful citizenship.

(4) Another very basal impulse, one of the chief traits of man, is the noetic instinct or curiosity, the lust to know and understand the environment, which began with the very development of the brain and has culminated in modern science. This dynamic urge is strong, in some sense stronger, among the ignorant and technically uneducated who realize their limitations. Even the illiterate workman has his intellect and is bound to use it wisely or otherwise. He welcomes everything and everybody who makes a pungent appeal, as radicals and agitators with their cheap and easy and often perverse solutions of all great questions surely know how to do. His

mentation may be ever so rudimentary and collective, as in the mass and mob, rather than individual, but mental pabulum of some kind he must have, and this need is as great as that of his body for food. Under the old guild system he found scope for his instincts in the craft itself, but this the ever-increasing specialization of modern mass production denies him so that he seeks to escape mental suffocation by listening to propagandists of revolution.

Kirschensteiner has evolved culture courses for some forty trades and occupations, so that a boot-black, e.g., knows something of leather, the history of footwear, etc., while the chimney-sweep knows the rudiments of combustion, ventilation, of the chemistry of soot, and thus not only can he use his brains as well as his hands but the two work together and not in separate domains. The ditch-digger is taught something of drainage, sewerage, etc. It is a faint dawn of the recognition of the noetic instinct that has prompted a few firms in this country to do some one, some several of the following things.

Some make periodic shifts from one process to a very different one so that each workman becomes familiar with several, and a few have a regular rotation by which each may acquire some skill in most processes. Sometimes workmen are taken in groups through the entire works by one employed for that purpose who explains to them everything so that they may see the bearing their particular process has on the finished product. This may take months in a large concern, but it is said to pay. Movies, too, are called into service in various factories so that at intermissions or at the close of certain days men can see all the processes on the screen. Other firms have gotten up and given freely to every employee elegantly illustrated textbooks, e.g., a leather book, steel book, harvester book, automobile book, etc., and this has stimulated interest, sometimes to a high degree. Others have inaugurated a new kind of shop committee, not to confer on the question of wages but on processes and labor-saving devices and to advance joint interests. Automatic machinery, e.g., a cotton loom, can be so loaded with shuttles that it will run, with no man in the building, for several hours and then stop, and this makes for the shortening of hours. Still other firms encourage bringing in visitors, especially the families of the workmen, and showing them through the mill, for this is thought to have a stimulating effect upon the activity of the workman, not only while the visitors are looking on but afterward for he wishes to show his skill and dignify the importance of his work. In some establishments every process is checked off to the individual so that any defect, even when discovered a

long time afterwards, can be brought home to the operator. This increases his sense of responsibility and also helps to develop a pride in good work. Other agencies which enable every worker, in ever so narrow a specialty, to see the whole are often supplemented by civic instruction because many of our workmen come from hard conditions in Europe, e.g., the Russians in whose country factory conditions were as bad as serfdom, so that here they are prone, all the more because of their disappointments in coming to this land of promise and rosy dreams, to give vent to all the antagonisms that were justifiable in the old country but utterly baseless here. The instinct and the example of so many educated rich young men in England in going to the colonies, and here in going West or beginning at the very bottom of an industry as working men in overalls in order to test themselves out and rise according to their abilities, is also in point.

But we must not forget that this same instinct impels labor to seek to know all about the profits and dividends and perhaps to become small stockholders, an ambition that some firms are now doing so much to help it realize and which perhaps all should do. The workman also has wider outside interests as a citizen and a member of society, and these we should do far more to guide into the right channels and set backfires to check counsels of violence and direct action. Our government at the beginning of its campaign against the "reds" burned all their literature, as Comstock did that of vice, but has lately seen new light, so that the post-office department now selects samples of every scrap of seditious and anarchistic literature, even to clippings. This is perhaps the most complete collection of its kind in the world, and is used not only in criminal deportation or espionage cases but will be available for future study by the social clinician. Our academic economists and even sociologists, freed from the excessive war censorship, are now doing invaluable work for the diffusion of sane ideas, which are bound to be a great factor in the harmonization of capital and labor, slow and hard as this campaign of education is going to be.

(5) It has been said that almost no man is so feeble or deficient in mind or body that he cannot excel in something, and conversely that the very best man will fail if he finds himself in the wrong place. Psychology is just learning how immensely individuals, even those of the same rank and training, differ from each other, and how immeasurably more effective our entire industrial system would be if we could only put and keep everybody where he would be doing his best thing. Perhaps no single device would accomplish more to give our

country the industrial supremacy it merits and now has the unique opportunity to attain in the world than the very arduous one of getting all the square men in the square holes and all the round men into the round holes rather than vice versa, which means wastage incalculable. We are tunneling this problem from both sides of the mountain; on the one hand, we have those who devote themselves to job analysis, finding just the traits most necessary for each vocation and even each specialty, and, on the other hand, vocational guidance studies individuals to find *the* one thing that nearly all can do well. We know the incalculable service that the personnel department rendered in the army by listing not only the trade but from three to five degrees of proficiency in it which each soldier had acquired, utilizing thus all the skills required in time of peace. Now there is a rapidly growing recognition of the advantages of the same differential psychology for the arts of peace. True, much of this work has been done hitherto by amateurs and even fakirs, but many firms are now seeking trained psychologists to test their employees and assign them to that place in the system for which they have the best native or acquired aptitudes. With aptitude, it must be remembered, goes taste and interest, so that not only productive efficiency but content is thus augmented. We have long realized, and are doing so now more than ever before, the growing specialization necessary for effective large-scale production, but we are only just beginning to recognize the fact that Nature itself has specialized individuals vastly more than we had supposed, so that in all this work we are simply utilizing the energies that Nature had already preformed but which had long lain at our hand untouched. Almost pathetic are some of the tales of workmen whom only a slight analysis would have rescued from doing things for which they were utterly unfit and put to things for which they were preeminently fitted, thus rendering them not only happier but more secure and, where a differential wage system prevails, often able to earn more. Unless all signs fail, the time is at hand when everyone, before finally entering upon his life work, whether at the end of his required schooling or at graduation, will have more self-knowledge, and when institutions that give diplomas will also study each individual more and be able to advise and guide him better into the career that promises the most for him.

(6) Man is the most gregarious of all animals, and gregarious animals are far more intelligent and more domesticable than those of solitary habits. Compare, for example, the dog and the cat. But man is the most gregarious of all creatures and was so even before the time his simian ancestors descended

from the trees. The prehistoric Cro-Magnon race eliminated the well-established Neanderthals in primitive Europe because they had a far more elaborate social organization. Man's very soul languishes in solitude, and there is no such stimulus as that of intercourse. We have lately listed 113 types of child organizations but no one has ever attempted to list all the thousands of organizations that have sprung directly from the herd instinct in adults.

The passion to get together and act collectively, which is seen all the way from the street gang and mob to the club, sect, and party, marks man as preeminently *the* herd animal. It is this instinct that depletes the country for the city, that is one factor in the difficulty of drawing servant girls or farm hands to the country. The individual needs to merge with his fellow-beings, and most of our thinking and still more of our feeling is done collectively in groups. Our conduct is made up, for the most part, of suggested action, and habits and character are molded by the social milieu. There are few psychic horrors greater than those described as due to long confinement or isolation that is really solitary, and when condemned to this the soul instinctively "pals" with the lower forms of life or invents imaginary companions.

This instinct was one of the chief charms of the saloon, and now that we have dispensed with it, the workman finds a vicariate for his social instincts in the trade union, which is thus greatly vitalized, or perhaps even in the excitement of the strike. All this shows that for this instinct of assembly, of getting into frequent and close rapport with his fellow-men provision must always be made, for every kind of wholesome convivium vents and releases a strain and tension which may break out in riotous form. Never has trade solidarity and consciousness been so intense as it is today in this country, to say nothing of the soviet in Russia and the syndicalists in France, so that we have here new forces to which we must readjust.

I have thus tabbed off and very inadequately sketched the six instincts which, as I see it, psychology deems oldest and most basal. There are, of course, plenty more, and there is still much diversity of view as to the relative importance and strength of the fundamental as well as of the accessory energies of Mansoul. There are also many other very different chapters in the relation of the science I represent to industry, viz., the psychology of skill, of employers, of efficiency and inventions, etc. But I think that I only voice the deep conviction of every worker in this field in saying that the world is now entering a new psychological age, which perhaps the

historians of the future will call another renaissance in recognizing the significance of psychic forces in the world, forces often too deep and large to enter the narrow field of consciousness. Primal urges of the soul, some of them as old as animal life itself, set in action currents that have behind them the whole momentum of evolution. Manifold as are the expressions of these primordial instincts, plastic as human nature is in adapting to new environments, in some respects its basal traits can no more be changed than can the laws of physics and chemistry.

Unless all signs fail, too, the time is at hand when every workman and every graduate will have more self-knowledge of his powers and weakness, aided, perhaps, by the tests of experts. In this respect the world needs a new and wiser statesmanship and diplomacy and is halting and distracted for want of a new leadership in industry, a new goal, and a new education.

Never were there so many open questions, never so much human energy so suddenly released as that which the war has mobilized, never such distrust of leaders and so loud a call for bigger and better trained men, never so many ways open to those at the stage of choosing their career or definitizing its details. May we not say that the graduates of this year in our own country and abroad never before in history went out into a world so throbbing with so many and intense interests and issues or in which there were so many possibilities of success or failure, dependent very largely on how well and truly we know ourselves and man, the highest study of mankind. Never was there a time when men in the later decades of life so longed to be young again like you. It was said of old that as Oxford and Cambridge think and feel, so England will go thirty years later; and now a leader of British thought says fifteen years later, for as the world war was fought by young men, it is they who will decide the issues of peace. As the instincts of young men are the best material for prophecy, so my closing admonition to you would be that in such choices as you may be called on to make affecting your life work do not be guided too much by opportunities and openings promising immediate advantage but also take counsel of your own deeper interests, even perhaps at some temporary loss, and seek the place where you can do your best thing and grow in it, and having chosen, aim at nothing short of mastery. Know your calling from the ground up, be an authority in it and not an echo, do not fear but cultivate originality, and do what you can to make industry a servant and not a master in the economic household. Remember that

the supreme test of every institution is how much it contributes to bring the race on toward an ever fuller maturity.

There is a perhaps yet larger view at which I can only hint in closing. The war saw us a united country, with partisan and class interests entirely subordinated to a great end. We even had a unique solidarity with all western Europe and our own eastern frontier was, for a time, the battle-front, and in the early days of the conference at Versailles the whole world throbbed with the high moral idealism of the Fourteen Points, which promised a new era if not the federation of the world which poets and idealists had long dreamed of. But now what a change has come over us! We now think only of our own frontier on the Atlantic coast and are at odds with our allies. Partisan strife, stimulated by the enormously increased government patronage, was never so bitter; class was never so hostile to class; interests never so active or potent; never were there so many irreconcilables who cannot compromise, to do which is the very essence of statesmanship and leadership of every kind; never were there so many profiteers, mad with the lust of individual or corporate gain; never has our government or Congress fallen so low in the respect of the people or been so recreant in the colossal task of meeting the new needs of the country! Coleridge said that those who begin by loving country more than they love mankind are likely to lapse into loving party more than country, sect more than religion, their business more than the welfare of the community in which they live, and will end in the supreme selfishness of loving themselves and their own personal advantage more than anything else. Are we doing anything to reverse these tendencies, to make democracy safe for the new nations which are now adopting it, or are we strengthening or weakening our own trust in it? Are there dollars in everything we seek, and is the merit of every cause to be measured by the success of "drives?"

Once mankind sought salvation in religion and there was a passion for self-sacrifice, which went so far that the church fathers had to call a halt on the rage for martyrdom. Men took vows of poverty, chastity, and obedience. Christianity gave all the Occident a new life, but the church today, beneficent as it is, seems to have lost its power to cope with selfishness. It is slow even to recognize the great new light of the higher criticism which offers it new sources of power. In the Renaissance education was the panacea; schools and universities were founded and a holy war waged against illiteracy, and science promised regeneration. Now all of our institutions are, and with abundantly good and just cause, bending their

energies to secure ampler funds. But which of them has yet reconstructed its curricula to meet the new needs of the new age that is upon us or realized that if they had provided us with better leaders, the immediate past would not have been so tragic or the future so full of forebodings in a time when every settled consensus is shaken and men are even questioning the foundations of our most cherished social institutions. This may seem pessimism, but it is not, because, at least for the psychologist, there is hope in the bottom of the Pandora box which Fate has now re-opened. There is one and only one source to which we can turn for hope that evolutionary processes will not be reversed but go on, and that is to the unconscious, instinctive nature of man, which in the past has evolved language, religion with all its deities and rites, every social, political, and industrial institution, and, because man is a herd animal, devised so many ways of checking egoism. His sentiments, feelings, instincts are as much vaster than his intellect as the folksoul is greater than the individual, and in human nature, as all progress bears witness, the good predominates over the bad. It is these deeper currents in the human soul that have wrought every salvation in history, and from this source alone can salvation now come. We do not yet know how. It will come by no panacea, and it will not come suddenly but will be so slow and hard that the patience of the world is likely to be tried as never before. It may not come from us who study the human soul because its problems are too vast for us, but it is well that we are beginning to feel a new responsibility for uncapping its energies. We are at the stage where chemistry was perhaps in the days of Lavoisier or physics in the days that preceded Newton. But our young men are seeing visions and our old men are dreaming dreams of an age when psychic forces will be just as dominant in every great enterprise of man as science is today in industry. Nor is our attitude toward this expectation of a new dispensation involving altruism and mutual help merely that of watchful waiting, but we see already many hopeful beginnings. And that is why, realizing the world's pressing need of a new ethics and a new morale, which is almost the diametrical opposite of the superman, we are optimistic and believe in a new and higher democracy yet to come which will be a real city of Mansoul.

BOOK REVIEWS

Recent Literature on the Child

The Dawn of Mind. By Margaret Drummond. N. Y., Longmans, Green & Co., 1919. 179 p.

The Problem of the Nervous Child. By Elida Evans. N. Y., Dodd, Mead & Co., 1920. 299 p.

The Mental Hygiene of Childhood. By William A. White. Boston, Brown & Co., 1919. 193 p.

La Escuela Secundaria en los Estados Unidos. By Amanda Labarca Hubertson. Santiago, 1919. 325 p.

Kinderideale. By. Dr. Heinrich Maner. Kempten und München, Jos. Röselischen Buchhandlung, 1914. 155 p.

Statistik des Kleinkinderalters. By Dr. Hans Guradze. Stuttgart, Enke, 1916. 28 p.

Margaret Drummond's *Dawn of Mind* is a rudimentary little treatise which is excellent from the viewpoint of orthodox psychology and child study, but which neglects all the newer knowledge of the mental life of childhood which has been gained by psychoanalysis and the psychology of the emotions. She begins with an elementary description of the nervous system, which is entirely accurate except that it overlooks the newest findings of neurology which indicate that new neurones are formed for two years after birth. The second chapter discusses the development of the baby's sensory world, with its original lack of color, definite shapeliness of objects, etc., which gradually approaches the adult norm all through the first two years of life. After the simple sensations have evolved, there comes the period of association of sensations, when the child connects the appearance of an object with its feeling to the touch, or of sounds with visual sensations, and all the other combinations which contribute to a complete understanding of the environment.

Miss Drummond classifies the first instinctive movements as grasping, sitting, creeping, rolling, kneeling, standing, walking, climbing, running, dancing and jumping. When she comes to discuss the life of instinct and emotion in full, the author follows the MacDougall scheme, speaking of the simple emotions of fear, anger, tender emotion, positive and negative self-feeling, disgust and curiosity and wonder, and showing how from these are built up the complex sentiments of gratitude, awe and reverence.

The first form of memory is styled by Miss Drummond as memory by recognition. She thinks that the baby recognizes familiar objects long before he is able to form any independent mental image of them. She maintains that visual imagery first appears in dreams, but is less certain when sound imagery appears. The baby learns to recognize the

mother's voice at an early stage of its existence, but perhaps the images of sound appear when the baby is first able to reproduce a tune. Motor memory shows itself very early in the way the baby adjusts its limbs for the dressing process, in learning to feed himself, etc. The verbal memory is especially active during the early months when the child is learning to talk.

Miss Drummond emphasizes the child sympathy and suggestibility, but it is perhaps impossible to emphasize too much what she terms "the child's tendency to catch emotions from others." It is this same characteristic of childhood that the psychoanalysts have emphasized in noting the conformation to the parent ideal and in the social conditioning or environmental modification of the emotional response. Its importance in determining the future of the individual has only recently been assigned its true evaluation. The chapter on "The Unlucky Baby" also confirms the findings of psychoanalysis, although written with a very evident lack of knowledge of that subject. Its account of the baby whose mother was insistent on doing all things for him, and his subsequent development, conforms to the numerous psychoanalytic cases which show the conflict between the desire to remain a child and the necessity for emancipation from parental control.

By far the best book in its field up to the present date is Elida Evans's *Problem of the Nervous Child.* It receives the endorsement of Dr. Jung, of Zürich, and is entirely worthy of the commendation which he gives it in his introduction. Its scope is somewhat suggested by the chapter headings, which are as follows: *Statement of the problem; The development of repression; Symbolic thought; The child and the adult; Mental behavior of the child; Defence reactions; The parent complex; Buried emotions; Child training; Muscle erotism; The tyrant child; Teaching of right and wrong; Self and character.*

With much more insight than Miss Drummond, Mrs. Evans comments upon the imitative tendency of the child and its unconscious response to the emotional attitudes of its parents. She shows that these may be either positive or negative in character,—that is, the child may accurately copy the emotional reactions of one parent or the other, or it may react in exactly the opposite manner, according as the parent becomes an ideal or an antagonist in the child's mental life. Jung, himself, has not brought out with more force or vividness the conflicting motives of infantile regression and necessity for emancipation from the parental guidance than has Mrs. Evans in her clear-cut generalizations and in her well-chosen case studies. There could indeed scarcely be a more sane and convincing presentation of these significant points of the family situation.

In her conception of the libido, Mrs. Evans is entirely in harmony with the common teaching of the Zurich school. She describes the libido as "an emotional force or urge which is in every form of life, whether vegetable or animal," and holds that it is the force which is inherent in life and love and evolution, an energy both racial and individual. It is the psychological analogue of the physical forces of nature which are manifest in the wind, in electricity, in radio-activity. It is in the libido-potential of the individual that all his possibilities of development lie, and the fulfillment of those possibilities depends upon its unobstructed and normal expression in various activities and sublimations.

The illness of the neurotic child may be due to one of two motives which must be guarded against. On the one hand, it may enable the child to remain in the shelter of the parental care, and allow it to

avoid the facing of the responsibilities of adulthood. On the other. it may satisfy the longing for power, and enable the child to become the household tyrant and center of attention. Neuroses which develop later are very often an attempt to escape the marital relation and satisfy the desire to return to a beloved father or mother. These are the familiar father and mother complexes with which psychoanalysis has long since made us familiar. More interesting are Mrs. Evans's accounts of the "muscle erotics," who represent a sexual arrest and can only find satisfaction of their adolescent cravings through incessant muscular activity and excitement.

All these motives of child behavior, if rightly understood by parents and teachers, furnish an invaluable guide to the training and education of the child. The best way to teach the child the difference between right and wrong, for instance, is by example rather than by precept, since the response to a situation is so often a matter of unconscious imitation rather than obedience to instructions. Parents must realize that too much love tends to make the child a weakling, incapable of bearing the adversities of life, just as too much harshness renders him defiant of all restraint and dangerously rebellious against social as well as parental authority. They must also realize that it is their duty to guide the child into a free existence, to permit it from the earliest years to make its own choices in every possible situation, in order that the adult individual may not be a weakling and a degenerate. In the performance of this duty, they will receive automatically a rich reward, for instead of the childish love which they relinquish, they will find their liberated sons and daughters returning to them a deeper and more loyal affection such as only men and women are capable of giving.

Altogether, Mrs. Evans's book is a splendid presentation of the best knowledge that psychoanalysis has been able to give us concerning the deeper motives of human conduct, and her case studies are illuminating in showing the practical application of these principles to the concrete problems of childhood. It is obviously written by a widely read and broadly experienced woman, with a real and adequate understanding of her subject.

Dr. White's book covers a part of the field which Mrs. Evans has treated in her volume, but is much more generalized, and lacks the concrete illustrations in the case studies that make her work so convincing. He begins with the concept of the child as the link between the past with all its vast heritage from primitive and even animal ancestry and the future with its untold potentialities. It is an old figure to students of evolution, but Dr. White treats it in a manner which should win sympathy from the popular mind. Indeed, the keynote of the whole book is its simplicity and directness, which eminently fits it for the reading of the general public.

According to Dr. White, modern psychology attempts to interpret human conduct as "a series of actions brought about for the purpose of changing conditions to make them more in keeping with the desires of the individual." These fundamental desires of the personality fall into two prime categories, the race-preservative and the self-preservative. The various activities of the child, therefore, all occur as an expression of one of these desires or instincts, but in the human child they are very complex activities because of the psychic ramifications of the two instincts which are almost illimitable. It is therefore better to say that human conduct has for its chief motives the

will to power and the longing for pleasure, which are the sublimated expressions of the ego-urge and the sex-urge, respectively.

Dr. White goes on in the approved psychoanalytic vein to discuss the effect of repressions on the mental life of the child, and to consider the role of the parents, etc. His statements are always clear and accurate, but give the impression of lacking the wide and intimate knowledge of individual children that is apparent throughout all of Mrs. Evans's treatment. Yet because of his explicitness and clear presentation of guiding principles, his book is a good supplement to hers. It may therefore be enteresting to compare his chapter headings with those of Mrs. Evans which have been previously quoted. They are as follows: *The child; The fundamental instincts; The development of the child; Stages of development; The family situation; Problems: education—punishment; Further problems: sexuality—repression—play; The function of the parents; Historical background; Conclusion.*

If we would see ourselves as others see us, we have only to look at the account of our educational system given by Senor Hubertson in *"La Escuela Secundaria en los Estados Unidos."* It is simply a detailed account of our secondary schools, their administrative organization, plans of study, programs and methods, the internal administration of directors and teachers, recently introduced courses such as domestic science, etc. It is hardly worth while to epitomize the contents of the book, since they are familiar to most English-speaking readers, and the Spanish-speaking student would find it more satisfactory to glance through the book itself, and particularly at the numerous charts and illustrations. The author thinks the chief difference between the school systems of the United States and of the European and South American countries lies in the greater centralization of educational control in the latter places.

Dr. Maner's book on *Kinderideale* is a summary of the answers to the following questionnaire which was given to 1,499 boys and 2,095 girls in the fourth, fifth, sixth, seventh and eighth years of school:

What person whom you know or of whom you have read would you most like to resemble? Why?

What would you most like to become? Why?

What book or what history do you like best? Why?

Who is your dearest friend? Why?

During school years, the ideal of the child is transferred from some member of the family circle to a person in the outside environment. At 10 years of age, for example, the children in the fourth year of school still retain the family ideal in the case of 30% of the boys and 43.7% of the girls. But by the time the eighth year of school is under way, this percentage has decreased to 10% among the boys and 14.7% among the girls. Almost any reason may be given for the preference of any particular member of the family, but it is generally some personal and emotional reason and almost never a logical one.

Many children, when they relinquish the family ideal, replace it by some figure they have come to know through history. In the children of the city schools, the per cent interested in some historical figure rises from 3% in the fourth year to 30.3% in the eighth year. Here the chief reasons given for the choice of a hero are his strength, his power, his fame, his genius, etc.

The religious character is another common ideal, whether it be Jesus, God, Mary, some saint, or any one of the Old Testament characters. These become ideals, the children say, because of their holiness, piety, freedom from sin, wisdom, power, or capacity to endure martyrdom.

When it comes to the question of the calling they would like to follow, some of the children can give no reason for their choice, while many give irrelevant or very naïve ones. A few give some religious motive, and still fewer can assign some rational explanation for their desires.

War stories, religious stories, and folk-tales, in the order named, head the list of preferred readings. Instructive literature is at the foot of the list.

The reasons given for the choice of the dearest friend score most heavily in the following order: gratitude, customary association, sympathetic understanding, general characteristics, character traits, appearance. Less than 1% of the children admit choosing an intimate friend because of difference of sex.

While the information thus collected is of undoubted interest to students of child psychology, it is evident that there are certain limitations imposed by the method. The choices made are probably entirely valid, but the reasons assigned are in every case entirely superficial, since the child cannot have any knowledge of the unconscious factors which undoubtedly play the largest part in the selection of a personal ideal or profession, as well as in all the decisions of life.

Dr. Guradze's little pamphlet is a very good reference source for the German statistics on birthrate, illegitimate births, infant mortality, etc. From these statistics the author concludes that the illegitimacy of the child is correlated with a high rate of infant mortality. He also discusses the statistical data from the viewpoint of the social classes involved, the death rate in the different months of the year, etc.

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BOOK NOTES

Growth During School Age. By PAUL GODIN (Tr. by SAMUEL L. EBY). Boston, Richard G. Badger, 1920. 268 p.

This book has been translated from the French in order to introduce to America a man who has studied scientific education for nearly forty years, and also with the design of directing greater attention to the contributions to the theory and practice of education in France. The translator believes that French educational practice has not been sufficiently appreciated in America. He calls attention to the fact that Dr. Godin's work is a model of scientific procedure in educational measurements and also a valuable contribution to adolescence. The second part of the book discusses the practical application to school room practice of the laws and principles stated previously. Part I, Analysis of Growth, tells us why growth should have a place among subjects of scientific education, its method of study, discusses the metrical proportions of the body from birth to adult age, the influences that act upon growth, puberty, and the laws of growth. Part II, Applications to Education and Pedagogy, discusses unequal growth and its causes, growth by great alternations, individualization of school furniture, control of physical education by the auxanological method, asymmetry, measurements in accordance with individual records, determination of "somatic individuality." There are sixteen plates that add much to the value of the book.

The American Red Cross in the Great War. By HENRY P. DAVISON. N. Y., The MacMillan Co., 1920. 302 p.

This book sets forth the scope, character, and effect of the work of the American Red Cross during the Great War. When it closed, there were thirty million Americans enrolled in its organization, mostly at home but some of whom were in foreign fields. There were many stories of special sacrifice and devotion, some of which are here given. The files of the War Council have been freely used, and the book contains a number of interesting illustrations. The twenty-two chapters treat of the origin of the work, comradeship, work for the soldier at home, in the navy, mobilizing children, the disabled soldier, Switzerland the central station, work in Belgium, Italy, Great Britain, Rumania, etc. This appears to be by far the best and most comprehensive account we have had or perhaps shall have of this great work.

Education: Its Data and First Principles. By T. PERCY NUNN. Lond., Longmans, Green and Co., 1920. 224 p.

This book is addressed to two classes of readers: to professional students it offers a preliminary survey of the whole field of educational theory and practice, while it also addresses a wider public, whose increased interest is the mainspring of social progress. The general purpose of the author is to reassert the claim of individuality to be regarded as the supreme educational end and to protect that ideal against both the misprision of its critics and the incautious advocacy of some of its friends. A courageous pursuit of this principle is above all things necessary in our civilization. The fifteen chapters

of the book, therefore, deal with such subjects as The Aim of Education, Individuality, The Will to Live, The Living Past, Play and the "Play Way," Nature and Nurture, Instinct, Growth of the Self, The Mechanism of Knowledge and Action.

The Teaching of Modern Foreign Languages in School and University. By H. G. Atkins and H. L. Hutton. Lond., Longmans, Green and Co., 1920. 246 p.

The editor of this book, which is in the Modern Educator's Library series, and his colleagues have in view the need of young teachers and of those training to be teachers. But since the school and the schoolmaster are not the sole factors in the educative process, educators in general may also find help here.

The book is divided into two parts: The School and The University. The first discusses the place of modern languages in general education, organization, methods, grammar, and history. Part II, The University, after an historical introduction, deals with the staff, organization, training of secondary teachers, scholarships and prizes, and civil service examinations.

Trends of School Costs. By W. Randolph Burgess. N. Y., Russell Sage Foundation, 1920. 142 p.

This treats of the mounting cost of education, teachers' salaries and their relation to the cost of living and to the salaries of other workers, the trend of building costs, doubling the school budget, and sources of income. It is a model of condensation and concise statement.

A Day Continuation School at Work. Ed. by W. J. Wray and R. W. Ferguson. Lond., Longmans, Green and Co., 1920. 212 p.

No attempt is here made to cover the whole question of continued education; the book deals with two day continuation schools actually at work. Rural schools and their peculiar difficulties are not included. Since this book is a collection of twelve papers by different contributors no uniformity of style or treatment has been aimed at or attained. Indeed, there is considerable divergence of view. The main point is that each contribution is the result of personal experience. Both girls' and boys' day continuation schools are described, problems of class teaching in boys' schools discussed, physical training in a girls' school, arts and crafts, literature as mental culture, coördination of school and works, the employer's part in continuation school work, etc.

Projects in Action English. By Fannie O. Johansen. Bost., Badger, 1920. 207 p.

In English composition, the author says, the teacher must guide the students through a period of oral preparation, writing down their thoughts, and correction. As to subject matter, there are two sources, one the direct in which the pupil may draw upon his own experience or creative imagination, and the indirect in which the pupil obtains his knowledge from class teaching or general or specific reading. Composition, whether oral and written, should express ideas that are original and spontaneous. Action is the basis for the test of sentence-structure, and to be effective it must be given without lengthy planning. The actions must be such as would be a credit to an educational institution. Thus, e.g., those tending to burglary should be discouraged.

The first part of the book deals with oral projects, arranged with reference to a junior high school; the second is devoted to written projects; while Part III gives samples of the compositions of some of the author's pupils.

The Chalif Textbook of Dancing. (Book III—Greek Dancing). By Louis H. Chalif. 1920, Pub. by the Author. 226 p.

The author of this work came to this country a dozen or more years ago, almost unknown but with remarkable European experience in ballet and other kinds of dancing. After some hardships he succeeded in establishing his now well-known normal school of dancing, and has given himself a high position in this art. Years ago he made a special study in the various countries of Europe of folk-dancing and has written several volumes illustrating it. In this book we have an effort to find the science of the art of Greek dancing and its pedagogy. He here considers dancing simply as an art, although urging that it also gives mental and physical health.

The Child Vision. By Dorothy Tudor Owen. Manchester, The University Press, 1920. 180 p.

This is a study in mental development and expression, and is concerned with the function and scope of composition, direct vision, imagery, oral work, writing, compression and expansion, essays, etc. There are four colored illustrations.

La Filosofia de lo Inexpresable Bosquejo de una Interpretacion y una Critica de la Filosofia de Bergson. By Pedro S. Zulen. Lima, Sanmarti y Cia., 1920.

El Desarrollo Fisico del Escolar Cubano Sus Curvas Normales del Crecimiento. By Georges Rouma. Habana, Morlon, 1920. 133 p.

An Index Number for State School Systems. By Leonard P. Ayres. N. Y., Russell Sage Foundation, 1920. 70 p.

This is a most convenient little handbook for those interested in these tables and indexes. It contains concise directions for constructing, applying, and interpreting the method to different data.

The Class-Room Republic. By Ernest A. Craddock. Lond., Black, 1920. 80 p.

This little book attempts to explain and describe two educational experiments which the author tried because of his belief in the need of reform in teaching. He then proceeds to discuss the advantages of the system he advocates, some objections to it, "The School Republic," and competitive work in the school republic.

The Manchester Grammar School, 1515-1915. By Alfred A. Mumford. Lond., Longmans, Green and Co., 1919. 563 p.

This ponderous tome gives us a very fascinating sketch of the development of one of the old English secondary schools. It is a regional study of the advancement of learning in Manchester since the Reformation. It is evidently a work of love, and certainly of great patience and much erudition, which no review could do justice to.

Practical Chemistry. By N. Henry Black and James Bryant Conant. N. Y., The MacMillan Co., 1920. 474 p.

This is an attempt to combine an introductory course in chemistry with a sense of its usefulness at every stage.

Fundamentals of High-School Mathematics. By H. O. Rugg and J. R. Clark. Yonkers, World Book Co., 1919. 368 p.

This is a textbook designed to follow arithmetic, and its method is synthetic.

The Individual and the Curriculum: Experiments in Adaptation. Publ. by Francis W. Parker School. Chic., 1920. 158 p.